Small places, big problems: Planning healthy environments in emerging African towns

The case of Karonga Town, Malawi

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Declaration

I, Donald Brown, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

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Abstract

Small and intermediate urban centres are expected to accommodate a large and typically growing share of sub-Saharan Africa's future urban growth. Yet many small settlements are ill-equipped to engage in effective urban planning due to severe local institutional capacity deficits, which threaten to embed environmental risk accumulation cycles into their urban development trajectories. To date, however, the largest cities have dominated most scholarly and practical attention in the debate on urban risk.

This study seeks to contribute to a small, but growing, body of literature on urban health risks in African towns through the case of Malawi, with specific reference to Karonga, an emerging secondary town. Malawi is one of the least urbanised and most rapidly urbanising countries in sub-Saharan Africa, with Karonga Town located in the least urbanised and developed part of the country. The town has grown from a village into the second largest urban centre in the North, providing initial insight into the urbanisation of risk at the bottom of the urban hierarchy.

The study uses a mixed methods approach at two scales: inter-urban and intra-urban. At the inter-urban scale, the study draws on the Malawi census and the Demographic and Health Survey (DHS) to assess the share of the urban population living in smaller settlements and their degree of access to basic services (water, sanitation and electricity) as key environmental health risk factors. Moving to the intra-urban scale, ethnographic explorations yield insight into Karonga's planning system and its role in shaping the relationship between the urban environment and health in a small African town setting. To assess the impacts of this relationship, hospital records collected over a twelve-month period (August 2016 to July 2017) are used to estimate the prevalence and distribution of health conditions with known environmental causes in the town's population.

At the inter-urban scale, the findings indicate that small towns account for a larger share of Malawi's urban population than previously thought, and that many have among the poorest service provision. At the intra-urban scale, the findings reveal the local governance challenges that in situ urban change is creating as government institutions seeking to incorporate urbanising populations conflict with existing chieftaincy structures struggling to maintain territorial control, resulting in planning failure and consequent environmental risks. Hypotheses are identified from the findings as a basis for developing further insights from future case study research, positioning Karonga Town at the forefront of a nascent research agenda focused on these increasingly important urban contexts.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF BOXES

Acronyms

ADC	Area Development Committee
APHRC	African Population and Health Research Council
ALC	African Lakes Company
ARV	Anti-Retroviral Treatment
BOMA	British Overseas Military Area
CCAP	Church of Central Africa Presbyterian
CCODE	Centre for Community Organisation and Development
CDs	Communicable diseases
COPD	Chronic Obstructive Pulmonary Disease
DANO	District Administration (Native) Ordinance
DALYs	Disability Adjusted Life Years
DC	District Commissioner
DDCs	District Development Committees
DEC	District Executive Committee
DEHO	District Environmental Health Officer
DFID	Department for International Development
DHMT	District Health Management Team
DHO	District Health Officer
DHS	Demographic and Health Survey
DPD	Director of Planning and Development
DPU	Development Planning Unit
DRM	Disaster risk management
DRR	Disaster risk reduction
EAs	Enumeration Areas
ENSO	El Niño Southern Oscillation

ESCOM	Electricity Supply Company of Malawi
ESRC	Economic and Social Research Council
ERAs	European Residential Areas
FAO	Food and Agriculture Organization
FAPO	Follow Along Participant Observation
GoM	Government of Malawi
GPS	Geographic Positioning System
GVH	Group Village Headmen
HMIS	Health Management Information System
HSA(s)	Health Surveillance Assistant(s)
IMF	International Monetary Fund
IRB	ICF International Institutional Review Board
IRD	Integrated Rural Development
IIED	International Institute for Environment and Development
IPCC	Intergovernmental Panel on Climate Change
KFCMP	Karonga Flood Control Measures Project
KDDP	Karonga District Development Plan
LDF	Local Development Fund
LSHTM	London School of Hygiene and Tropical Medicine
MASF	Malawi Social Action Fund
MCP	Malawi Congress Party
MHPF	Malawi Homeless Peoples Federation
MWK	Malawi Kwacha
MPs	Members of Parliament
NAO	Native Authority Ordinance
NCDs	Non-communicable diseases

NCO	Native Courts Ordinance
NCST	National Committee on Science and Technology
NDRMC	Neighbourhood Disaster Risk Management Committee
NGO	Non-governmental organisation
NRWB	Northern Region Water Board
NSO	National Statistical Office
NPDP	National Physical Development Plan
NUHDSS	Nairobi Urban Health and Demographic Surveillance System
NUP	National Urban Policy
OPC	Office of the President and Cabinet
PCs	Paramount Chiefs
RICHE	Research Initiative for Cities and Health
RGCP	Rural Growth Centres Programme
SCDP	Secondary Centres Development Programme
STAs	sub-TAs
TA	Traditional Authority
THAs	Traditional Housing Areas
TTC	Teacher's Training Centre
UCL	University College London
UN	United Nations
UNDESA	United Nations Department of Economic and Social Affairs
USAID	United States Agency for International Development
Urban ARK	Urban Africa Risk Knowledge
VDCs	Village Development Committees
VIP	Ventilated Improved Pit Latrine
WASH	Water, Sanitation and Hygiene

WDCs	Ward Development Committees
WHO	World Health Organization

Chapter 1 Introduction

Contemporary urbanisation patterns encompass a spectrum, ranging from the smallest villages and towns, to intermediate and secondary centres, to large and mega cities (Satterthwaite 2006, 2017). While Africa has typically been thought of as a rural continent, these patterns are now widely observable (Pieterse and Parnell 2014). The continent's urban population is already greater than that of North America's and is expected to accommodate a large share of the world's future urban growth (UNDESA 2015). Most of this growth is expected to occur south of the Sahara Desert, where as much as 40% of the urban population is estimated to live in small and intermediate urban centres with fewer than 500,000 inhabitants (Satterthwaite 2016a). These centres are expected to accommodate a large and typically growing share of the region's future urban growth (ibid), making them central not only to Africa's urban transition, but also that of the world.

Despite their demographic importance, smaller settlements typically lack capacities to plan and manage urban growth, provide basic services, and adapt to environmental hazards, ranging from unsanitary conditions, to seasonal floods, to large-scale disasters (Birkmann et al. 2016; Dodman et al. 2009; Hardoy et al. 2001; Hewett and Montgomery 2001; Satterthwaite 2017; Satterthwaite and Tacoli 2003; UN-Habitat 2006). Up until now, however, most scholarly and practical attention has been paid to the largest cities (Hardoy et al. 2001; Wisner et al. 2015; Brown et al. 2017). Consequently, very little is known about the relationship between the urban environment and health in smaller centres, how urbanisation is reshaping this relationship, and what the prospects are for planning healthy urban environments in this context.

This study seeks to address this gap through an in-depth exploration of Malawi, with specific reference to Karonga, an emerging secondary town in the Northern Region. Malawi is one of the least urbanised and most rapidly urbanising countries in sub-Saharan Africa, with Karonga Town located in the least populated, urbanised and developed part of the country (Manda 2013, 2014). The town has grown from a village into the second largest urban centre in the North, providing initial insight into how processes of in situ urbanisation are transforming rural territories and their environments.

This study's treatment of in situ urbanisation differs from other accounts of Africa's urban transition that focus primarily on the causes and patterns of urbanisation (for example, Fox 2012; Potts 2012; Satterthwaite 2016a) and peri-urbanisation (for example, Simon et al. 2004; McGregor et al. 2006). This study seeks to expand these accounts by exploring the *placed-based dynamics of African urban emergence from the bottom up*, with a focus on the consequences

for the urban environment and rural governance regimes based on the case of Karonga Town. To guide this exploration, a new framework is introduced based on three analytical lenses:

- ***Demographic lens****:* Analysing the socio-spatial distribution of environmental health in urbanising populations, drawing on insights from gender and urban change literature;
- ***Ecological lens****:* Analysing the interactions between the determinants of environmental health across the full spectrum of hazards (everyday, small and large) at multiple nested scales (individual, household, neighbourhood, town-wide, national, international), drawing on socio-ecological systems theory; and
- ***Institutional lens****:* Analysing the urban planning systems that shape the quality of the urban environment and related health risks and outcomes, drawing on theories of urban governance.

The novelty of the framework is three-fold. First, it draws from perspectives on gender and urban change to understand how urbanisation is reshaping the relationship between the urban environment and health socially and spatially. These perspectives enable the generation of disaggregated demographic and health data on environmental health risks and outcomes in urban populations (and sub-populations), addressing longstanding data gaps in smaller, more marginal urban locations. Second, the framework incorporates socio-ecological systems theory to understand the complexity of urban health in a small African town context. In doing so, it departs from conventional frameworks that treat the determinants of urban health in linear and largely deterministic terms, and without considering the importance of local context. Lastly, theories of urban governance are developed to understand the evolution of rural governance transformations arising from processes of in situ urban change. Most scholarly and practical attention has been paid to the governance transformations occurring in large metropolitan areas and to a lesser extent transitional zones at the peri-urban interface, constituting a key knowledge gap that this framework seeks to address.

The framework's three lenses are used to generate hypotheses to be tested in future research, positioning Karonga Town at the forefront of a nascent research agenda aimed at planning healthy environments in these increasingly important urban settings. The intention is not to provide simplistic generalisations about small African towns, but rather to develop in-depth empirical and theoretical insights that may be of broader relevance. The framework's analytical lenses are intended to guide future research to that end.

This Chapter is comprised of five sections. The first section begins by outlining the research problematic and the study's contribution to knowledge in the context of an international

research project called Urban Africa Risk Knowledge (Urban ARK) and beyond. Section two introduces the case of Karonga Town and outlines the different environmental health risks its population faces. The third section outlines the research questions and objectives, while the fourth outlines the themes central to the research. The Chapter concludes by outlining the structure of the dissertation.

Box 1.1: Key terms and definitions

Smaller African towns/smaller urban centres: Those with relatively small population sizes in national urban systems.

Environment: The quality and characteristics of the physical/built environment (buildings, infrastructure, open/public spaces used for human activities) as they relate to the quality and characteristics of the natural environment (land, water, air, soil) in socio-ecological systems shaped by processes of urban change. Living and working environments are included.

Environmental health: The absence of disease or infirmity linked to the environment, and the capacity to plan healthy environments (Corburn 2009). Environmental health problems have known environmental contributions/causes (Prüss-Üstün and Corvalán 2006).

The determinants of environmental health: The conditions (socio-economic, demographic, biophysical, institutional and political) that influence environmental health (Mitlin and Satterthwaite 2013). These conditions do not exist in isolation; they overlap and mutually reinforce one another in complex systems (Glouberman et al. 2006).

Healthy urban environments: Those free of environmental health risks (everyday, small and large).

Population health: The distribution of (environmental) health outcomes within populations and sub-populations depending on social identity (age, gender, ethnicity, religion, ability/disability), the quality of the environment, and processes of urban change (Galea et al. 2005).

Urbanisation: The share of the national population living in urban areas classified as 'urban' (McGranahan and Satterthwaite 2014).

In situ urbanisation: The placed-based transition from a rural area into an urban area.

Urban growth: The increase in the absolute number of people living in areas classified as 'urban' (McGranahan and Satterthwaite 2014).

Structural transformation: Occupational shifts driven by the transition from agricultural to non-farm activities (typically urban-based). These shifts generally accompany urbanisation (Christiaensen and Todo 2013).

Urban planning: "[I]ntentional, and value-driven, societal efforts to improve the built and natural environment. Planning is also (and not infrequently) initiated by groups other than professional planners and governments (such as non-governmental and community-based organisations, and business), and the 'planning system' frequently incorporates these sectors in processes which are inevitably political" (Watson 2009: 154).

Public health: An ongoing process of health promotion involving different institutions (formal and informal), stakeholders and disciplines in understanding and addressing population health and its many determinants (socio-economic, environmental, institutional, political) (Corburn 2009).

(Disaster) risk reduction: Measures to reduce and/or eliminate the impacts of hazards of different sizes (everyday, small and large) and frequencies (recurrent and episodic). Reducing risk to these hazards requires the involvement not only of disaster risk reduction (DRR), but also urban planning and public health (Brown et al. 2017).

Risk: The likelihood of future loss and damage depending on hazard, exposure and vulnerability (IPCC 2012).

Hazard: The potential for harm caused by a natural or human-induced event (IPCC 2012).

Exposure: The presence of people; livelihoods; environmental services and resources; infrastructure; or economic, social, or cultural assets in places that could be adversely affected (IPCC 2012).

Vulnerability: The propensity or predisposition to be adversely affected (IPCC 2012).

Disaster: A situation or event that overwhelms local capacity, necessitating a request to national or international level for external assistance (IPCC 2012).

Resilience: The ability of a system and its component parts to anticipate, absorb, accommodate, or recover from the effects of a hazardous event in a timely and efficient manner, including through ensuring the preservation, restoration, or improvement of its essential basic structures and functions (IPCC, 2012).

Basic infrastructure and services: Those that generally fall under the purview of local/municipal governments to provide and maintain. They include, but are not limited to: piped water connections and networks (including water plants), drainage, sewerage, solid waste management (including waste collection points and vehicles), electricity connections, and all-weather roads (Hardoy et al. 2001).

Decentralisation: Political decentralisation entailing the downward transfer of responsibilities to elected representatives at the local government level; administrative decentralisation entailing the redistribution of responsibilities and financial resources for the planning and management of certain public functions; and fiscal decentralisation entailing the transfer of responsibilities to local governments to manage their financial budget raised either locally or through transfers from higher levels of government (Diep et al. 2016).

Traditional/non-statutory settlements: Those that do not conform to official regulations either because they pre-date formal planning systems or because they were constructed outside such systems in violation of official regulations. The term 'informal settlement' is not used because it does not sufficiently describe the origins of traditional settlements in African towns governed by pre-existing customary rules, norms and traditions.

1.1 Problematic and contributions

This study is part of Urban Africa Risk Knowledge (Urban ARK), a three-year international research project funded by the Economic and Social Research Council (ESRC) and the Department for International Development (DFID). The project was launched in 2015 by partner institutions in sub-Saharan Africa and the United Kingdom, including the Bartlett Development Planning Unit (DPU), with the aim of breaking cycles of urban risk accumulation through:

- Generating detailed local data on hazards (everyday, small and large) and their underlying socio-economic vulnerabilities and drivers in the context of poverty and informality, urbanisation, disasters and climate change; and
- Building the capacity of local stakeholders (public and private, formal and informal, governmental and non-governmental) through training and applied research (Adelekan et al. 2015).

While this study forms part of Urban ARK, it was independently funded by a DPU Doctoral Fellowship and so was free to focus the scope of the research and select the study site. The study became part of Urban ARK given my involvement in shaping the project's conceptual framework and core focus on urban risk. It thus seemed logical to link the study with Urban ARK from both the project's perspective and that of the research with the aim of better understanding the health-related dimensions of urban risk and the implications for urban planning in smaller African urban contexts using Karonga Town as a case study.

This thesis seeks to contribute to Urban ARK by building on three points of departure that separate the project from previous research in this area. First, the project views risk across a

spectrum, encompassing everyday hazards (e.g. infectious and parasitic disease, road traffic accidents), small disasters (e.g. localised landslides, seasonal floods) and large-scale disasters (e.g. tropical cyclones, earthquakes, tsunamis) (Bull-Kamanga et al. 2003). This allowed environmental hazards of different sizes and frequencies to be considered beyond a primary focus on large-scale events, thus combining disciplinary perspectives from urban planning and public health (traditionally focused on small and everyday events) with disaster risk reduction (DRR) (traditionally focused on large-scale episodic events). Second, the project positioned urban DRR in the debate on social vulnerability in order to understand *who* is most vulnerable to *what*, *where* and *why*. This allowed sociological insights to be incorporated with those of the natural sciences, thus moving beyond the traditional focus on hazard exposure, frequency and intensity toward the characteristics of people and places that influence susceptibility when exposed to harm (Wisner et al. 2003). Lastly, the project addresses longstanding data and knowledge gaps on smaller urban centres through the inclusion of Karonga Town in the sample, providing an opportunity to identify small settlements as important to the overall burden of urban risk and as key areas for knowledge and policy formation in the wider project and beyond.

It is important to acknowledge my role in shaping each of these departure points at different stages of Urban ARK (see Adelekan et al. 2015; Brown et al. 2017; Levy 2018; Satterthwaite et al. 2018). At the initial stage, I worked closely with partners to develop the project's four core work programmes (Box 2.2), particularly one and four. The first, on vulnerability assessment, sought to reveal the full spectrum of urban risks. It was led by the International Institute for Environment and Development (IIED) based on its longstanding work on the subject (for example, Hardoy et al. 1990). The fourth work programme sought to understand the role of urban development, planning and governance in both the production and reduction of urban risks. It was led by the Bartlett DPU where I worked as a research assistant to help develop the project's conceptual foundation, contributing substantially to one of the first scholarly outputs (see Adelekan et al. 2015), to a related policy brief (Brown et al. 2017) and to a more recent paper on the relationship between gender and urban risk (Levy 2018). This section explains how the study contributed to each of these departure points in the wider project and beyond.

Box 2.2: Urban ARK's core work programmes

1. Vulnerability assessment: Through deploying vulnerability and loss assessment methodologies, focus is on assessing hazards and underlying socio-economic and environmental conditions of vulnerability.

2. Hazards assessment: *Assesses* (a) multi-hazard relationships and their impact on infrastructure networks and land use, including the production of new digitised land use maps, and (b) climate downscaling for urban planning and decision making.

***3. Root cause analysis and historical governance trajectorie*s**: Investigate (a) the dynamic historical processes of urbanisation and governance in sub-Saharan Africa that shape contemporary expressions of hazards, vulnerability, and risk management capacity, in response to both everyday hazards and disasters; and (b) the factors shaping the emergence and contribution of mediating or intermediate actors around urban development and risk reduction, with a focus on the governance space between local community actors and organisation of local government.

4. Urban development, planning and governance: Investigate relationships between urban risk and its production and reduction through an examination of (a) current and recent investments in infrastructure, construction and planning; (b) urban planning policy and regulatory frameworks; (c) the underlying power dynamics between stakeholders that guide urban development, including organised grassroots and local governance networks, government, private sector, and others without preventing capacity for transformation.

Source: Brown et al. (2017)

1.1.1 The spectrum of risk

Urban ARK conceptualises risk across a spectrum (Table 1.1), ranging from everyday hazards, to small disasters (termed 'extensive risk'), to large disasters (termed 'intensive risk') to better understand the relative importance of different hazards for loss and damage, and their underlying drivers (Adelekan et al. 2015).

Table 1.1: The spectrum of risk

Nature of event	Everyday hazards	Small disasters	Large disasters
Frequency	Everyday	Frequent (often seasonal)	Generally infrequent
Typical hazards	Diseases, road traffic injuries	Seasonal floods, localised landslides	Earthquakes, storms, floods
Scale	Small (1-3 persons killed, 1-9 injured)	Moderate (3-9 killed, 10 or more injured)	Large (10 or more killed, 100 or more seriously injured)
Total impacts on premature mortality and injury	Main cause	Probably significant/under-estimated	Catastrophic in certain places and times, but relatively low
Type of risk	Extensive		Intensive

Source: Adapted from Bull-Kamanga et al. (2003), informed by UNISDR (2009, 2011)

The risk spectrum is both conceptually and practically important given the array of hazards that threaten the lives, livelihoods and assets of African urban dwellers (Bull-Kamanga et al. 2003; Manda and Wanda 2017; Pelling and Wisner 2009; Smit and Parnell 2012; Adelekan et al. 2015; Satterthwaite 2017; Songsore 2017; Zweig and Pharoah 2017). However, in combining everyday hazards and small disasters, extensive risk potentially obscures the former. It also assumes that extensive risk is discrete from intensive risk, despite their complex interactions. For example, poor sanitation can contribute to everyday water, sanitation and hygiene (WASH) related diseases and create the conditions for cholera outbreaks during flood events (seasonal and episodic) (Songsore 2017). Urban ARK therefore views everyday, small and large events both individually in orders to assess the relative importance of their impacts, and interdependently in order to explore their multiple interactions.

A desk-based study by Satterthwaite et al. (2018), of which I was a co-author, reviewed the availability of data on urban health risks and highlighted the contributions made by Urban ARK to understanding the risk spectrum in the sub-continent. This thesis builds on two studies that Satterthwaite et al. review. The first by Adelekan (2016) documented the multiple risks faced by residents of Ibadan (Nigeria) based on newspaper reports, hospital records and data on road traffic accidents and emergencies. While the methodology did not capture everyday hazards due to a lack of detailed data, the findings indicate the significance of small disasters: between 2000 and 2015, the leading causes of death in the city were vehicle accidents (34%) followed by crime (22%), violence (13%), fire (12%) and floods (8%).

The second study by Manda and Wanda (2017) used a town-wide questionnaire survey to reveal the spectrum of risks faced by residents of Karonga Town, including everyday events (such as political and gender-based violence, road traffic accidents), small events (such as political violence, seasonal floods and drought), and large events (such as earthquakes, flood disasters). Based on the findings, Manda and Wanda suspect that “everyday risks may be causing more premature death than disasters” (ibid: 22) given the large number of deaths from tuberculosis (67) and respiratory diseases (32) documented in hospital records for 2014.

In my view, these two studies came closest to developing the type of detailed database on the health impacts of urban risks that the first Urban ARK work programme on vulnerability assessment was aiming for. But as mentioned, the data sources compiled by Adelekan did capture everyday hazards. Nor did they provide detailed data at the neighbourhood scale since the location of many events were not recorded, thus obscuring the distribution of loss and damage at the intra-urban scale. The survey by Manda and Wanda also was not disaggregated by location or by sex and age, resulting in similar limitations.

This thesis builds on these studies by providing a detailed analysis of hospital records over a twelve-month period (August 2016 to July 2017) in order to document the impact of environmental hazards of different sizes and frequencies on population health in Karonga Town. The aim is to develop an urban health database of use to local researchers and health practitioners interested in monitoring and assessing the social and spatial distribution of health outcomes linked to known environmental hazards. This method marks one of the first known efforts to dissagregate health records for an urban population in Malawi for the purposes of developing urban intelligence and disease surveillance.

1.1.2 The social construction of risk

Urban ARK positioned itself in the debate on social vulnerability (Blaikie et al. 1994; Alexander 2000; Pelling 2003; Wisner et al. 2003; Bradshaw 2015; Wisner 2016). This debate emerged to challenge the conventional view of disasters as 'natural' phenomena by reconceptualising them as social constructs "in the sense that underlying structural relations turn naturally occurring hazards into disasters for particular groups of people, based on their social vulnerabilities" (Levy 2018: 3). This view emerged from a seminal book by Blaikie et al. (1994), who were among the first to develop the concept of social vulnerability, understood as "the characteristics of a person or group and their situation that influence their capacity to anticipate, cope with, resist and recover from the impact of a natural hazard (an extreme natural event or process)" (Wisner et al. 2003: 11).

This concept has been adopted in the literature on urban DRR to understand why the urban poor almost always bear the brunt of disaster loss and damage (see Pelling 2003). The answer to this question centres on the three commonly accepted dimensions of risk: exposure (the urban poor disproportionately live in hazard-prone areas, such as steep slopes, flood plains, low-elevation coastal zones); vulnerability (the urban poor disproportionately live in poor quality housing on insecure land lacking adequate provision of basic infrastructure and services); and capacity to cope (the urban poor typically lack the resources and assets to prepare for disaster events, cope with their impacts, and recover and rebuild) (Sanderson 2000; Hardoy et al. 2001; Bull-Kamanga et al. 2003; Pelling 2003; Bartlett 2008; Douglas et al. 2008; Moser and Satterthwaite 2008; Dodman and Satterthwaite 2009; Pelling and Wisner 2009; Hardoy et al. 2011; UNISDR 2011; Dodman et al. 2013; Mitlin and Satterthwaite 2013; Adelekan et al. 2015; Dodman et al. 2017; Satterthwaite et al. 2018).

Several studies under Urban ARK (Adelekan et al. 2015; Dickson et al. 2016; Faye et al. 2016; Dodman et al. 2017; Mberu et al. 2017; Satterthwaite et al. 2018) addressed gender relations as an underlying source of vulnerability among poor urban women and men. This study builds on this research not only by providing a socially and spatially disaggregated analysis of hospital records, as mentioned above, but also by analysing how gender relations help to explain why certain women and men tend to be more vulnerable to environmental health hazards than others, and how processes of in situ urban change may be reshaping the socio-spatial distribution of these hazards. Few studies have generated detailed insights into the role of gender relations in shaping differential exposure to urban health risks (Frye et al. 2008), with some notable exceptions (see Jabeen 2014).

1.1.3 The nature and scale of risk in smaller African urban centres

Urban ARK's third point of departure targets longstanding data and knowledge gaps on urban risks in smaller centres (see Wisner et al. 2015; Satterthwaite 2017) through the inclusion of Karonga Town in the sample. The nine other urban centres that were selected had populations greater than 1,000,000 (Table 1.2).

Table 1.2: Urban centres included in Urban ARK, by size, 2015

Rank	Urban centre	Region	Estimated population size (2015)
1	Dar es Salaam (Tanzania)	Eastern Africa	5,116,000
2	Nairobi (Kenya)	Eastern Africa	3,915,000
3	Cape Town (South Africa)	Southern Africa	3,660,000
4	Dakar (Senegal)	Western Africa	3,520,000
5	Addis Ababa (Ethiopia)	Eastern Africa	3,238,000
6	Ibadan (Nigeria)	Western Africa	3,160,000
7	Mombasa (Kenya)	Eastern Africa	1,104,000
8	Niamey (Niger)	Western Africa	1,090,000
9	Freetown (Sierra Leone)	Western Africa	1,007,000
10	Karonga Town (Malawi)	Eastern Africa	63,000 (2018 est.)*

*Population estimates for 2015 were unavailable.
Data source for Karonga Town: NSO (2008)
Data source for all other urban centres: UNDESA (2015)

The sample was chosen based primarily on convenience given the project's emphasis on working with local partners, including Mzuzu University (Mzuni) in Malawi, where I previously worked, as discussed below. That most of the local partners tend to work in relatively large cities, including those in which they are based, explains in part why the sample is not representative of urban size.

The inclusion of only one smaller urban centre in the sample also reflects in part their tendency to be located in peripheral areas that are often hard-to-reach, especially for external researchers. Karonga Town is a two-day drive away from the capital city, Lilongwe, where Kamuzu International Airport is located. Parts of the main road leading to the town are poorly maintained and frequently damaged by floods during the rainy season, forcing travellers to either turn back or wait for the road to be repaired. At one point during the field work, it took three attempts to travel back to Karonga Town from Mzuzu, a city located a five-hour drive away, after a bridge on the M1, the only road connecting the town to the rest of the country, was washed away twice by flood waters (Figure 1.1).

Figure 1.1: A bridge along the M1 Road washed away by flood waters, April 2017

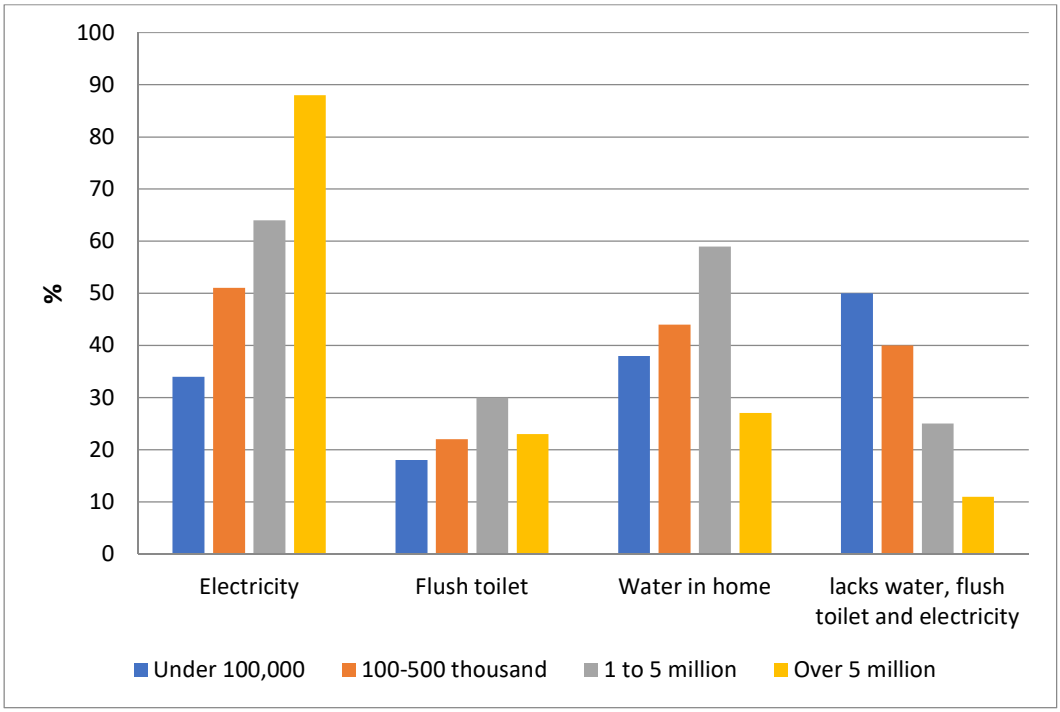
Photo credit: Author (2017)

My decision to work in Karonga Town was motivated by my prior experience as an Assistant Lecturer at the Department of Land Management at Mzuni between 2010 and 2011. During my time there, I observed the small city of Mzuzu rapidly grow without adequate planning, resulting in the accumulation of multiple environmental risks, ranging from poor water and sanitation, to solid and liquid waste, to seasonal floods. So when Karonga Town was selected as a case study

by Mzuni, it was a natural choice to focus my case study on the town as a way of continuing my work in the country.

This study contributes to the wider Urban ARK project by grounding Karonga Town in broader debates on environmental hazards in smaller setlements. These debates highlight a nascent body of evidence indicating that environmental health tends to worsen the smaller the urban size. The first body of evidence comes from Demographic and Health Survey (DHS) data compiled by Hewett and Montgomery (2001) for settlements of different size categories in 31 sub-Saharan African countries. The data indicate that smaller urban centres have poorer provision of electricity, piped water and flush toilets than larger urban centres (Figure 1.2). An exception was piped water in the home, which was lower only in centres with over 5 million inhabitants.

Figure 1.2: % of households in urban centres of different size categories with access to electricity, flush toilets and piped water in the home in 31 sub-Saharan African countries



DHS data compiled by Hewett and Montgomery (2001)

DHS data compiled by Montgomery et al. (2004) (Table 1.3) show that levels of provision of electricity, piped water and flush toilets display similar differences in other developing regions as in sub-Saharan Africa, with most smaller urban centres of under 100,000 inhabitants having the poorest provision, and that urban centres of all sizes, but particularly smaller centres in sub-Saharan Africa, have poorer provision than all other developing regions. These date indicate that

access to basic services is lowest in smaller African urban centres relative to those in all other developing regions.

Table 1.3: Differences in levels of public service provision between developing regions

Piped or well water on premises (% of households served)					
	Under 100,000	100,000 to 500,000	500,000 to 1 million	1 to 5 million	Over 5 million
North Africa	79.6	89.0	91.2	82.6	94.8
Latin America	66.0	73.8	79.8	64.9	90.1
South/Central/West Asia	64.0	72.4	67.0	74.1	61.0
Southeast Asia	36.1	50.2	39.2	56.1	53.2
Sub-Saharan Africa	35.4	45.1	42.3	55.1	N/A
Access to flush toilet (% of households served)					
	Under 100,000	100,000 to 500,000	500,000 to 1 million	1 to 5 million	Over 5 million
North Africa	88.3	95.4	95.4	93.1	98.5
Southeast Asia	78.1	82.5	89.1		84.8
Latin America	42.6	57.7	61.6	65.3	82.3
South/Central/West Asia	36.8	56.0	71.5	75.9	82.1
Sub-Saharan Africa	18.0	20.6	25.4	30.5	N/A
Access to electricity (% of households served)					
	Under 100,000	100,000 to 500,000	500,000 to 1 million	1 to 5 million	Over 5 million
North Africa	90.9	94.4	93.8	88.7	99.1
Latin America	84.0	89.9	97.4	98.0	99.1
Southeast Asia	83.7	90.4	85.6	97.2	98.8
South/Central/West Asia	81.0	89.1	93.3	94.3	91.6
Sub-Saharan Africa	33.8	46.7	52.0	65.5	N/A

Source: DHS Data compiled by Montgomery et al., (2004: 173)

The second body of evidence base comes from case studies (Box 1.3) compiled by UN-Habitat (2006) on provision of water, sanitation and solid waste collection in smaller African towns (with fewer than 50,000 inhabitants). These studies show that most towns lacked provision of water (within the home, yard, or close by), meaning that a high proportion of households relied on untreated water. Most smaller urban centres also lacked provision of adequate sanitation, meaning that a high proportion of households relied on either pit latrines or the bush. Most households had no public provision of sewers or solid waste collection, while the few drains that did exist were often blocked with waste (ibid). Such conditions are permissive of a range of water and sanitation-related diseases (such as diarrhoea and worm infections) and vector-borne diseases (such as malaria) (Hardoy et al. 2001), as discussed in Chapter Two (section 2.1.4).

Box 1.3: Case studies on service provision in smaller African towns

Kumi, Uganda is a district capital with a population of around 17,000 in 2000. Kumi's water supply is supported by pumps and boreholes, including overhead tanks supplying a piped distribution network with public kiosks and some household connections. Only two of the town's 15 kiosks were operational. Water availability was also confined to just two hours a day. Without a reliable water supply system, most households relied on water kiosks or vendors. Around 60% of households had pit latrines, with two free public toilets in the town centre, but the custodian was often absent. A third public toilet was built beside a new market, but was never completed. Water vendors are mostly men who commonly harass women and children to obtain priority access in queues.

Kyotera, Uganda is the busiest centre in the district owing to its location next to a main road leading to Tanzania. With a population of 10,000, Kyotera is growing rapidly. Despite rising demand for services, the town lacks a public water supply system, relying instead on piped water supplied by a local church project, but the water is of poor quality, inadequately treated, and infrequently supplied due to regular power outages. Other water sources include wells, boreholes and rainwater. Around two-thirds of the population have pit latrines, while 20% rely on four public toilets. The town lacks a sewer system and domestic solid waste collection. The storm drain system is inadequate, and drains that do exist are usually clogged with solid waste.

Bunda, Tanzania had a population of 46,178 in 2002, half of which was served by the piped water system operational for eight hours every other day. Despite the town's growth, the system has not expanded since it was constructed in 1971. Most new areas, including low-income areas, are unserved, forcing residents to collet water from wells, street vendors or the lake. Of the 365 connections available in 2004, 191 were metred, while 73% of the water entering the system was unaccounted for. The town lacks a sewer system and few houses have septic tanks. There is no public provision of solid waste collection, while the drainage system is inadequate.

Homa Bay, Kenya is a trading, fishing and district centre with a population of 32,600. The water supply system was constructed in 1958 and rehabilitated in 2001. It serves 15,000 residents through 1,672 legal connections. Water quality is often poor and water volume below demand due to a faulty treatment plant. Low pressure, leakages, blockages, vandalism and illegal connections (40% of water is unaccounted for) also impacts water supply. Several unplanned settlements are unserved, forcing their inhabitants to collect water directly from the lake. Since only 22% of the population is connected to sewers, most households rely on pit latrines, toilets connected to septic tanks, or the bush. Overflowing toilets and sewers are common during the rainy season. Storm drains and solid waste collection is widely lacking, meaning that drains are often blocked.

Mbandjock, Cameroon had a population of around 20,000 in 1996, of which only 20% had access to piped water. The remainder relied on wells and springs, most of which were contaminated with faecal

matter from humans and/or animals. Hospital data show that diarrhoeal and gastrointestinal diseases are among the most common in the town followed by malaria and onchocerciasis. There is no sewer system, so most people discard their sewerage into pit latrines or septic tanks.

Source: Drawn from UN-Habitat (2006)

This study analyses the 2010 DHS to determine whether the inter-urban differences in access to services documented above are observable in Malawi. To do so, 2008 census data are analysed using a new four tier settlement hierarchy based on clear population size criteria for primary centres (>100,000), secondary towns (50-99,999), intermediate towns (20-49,999) and small towns (5,000-19,999). The hierarchy was proposed by Manda (2013) based on his assessment of urbanisation patterns and trends in Malawi, which highlighted the need for more detailed data for individual urban centres of different sizes and locations. The hierarchy is used as the sample framework for the analysis of the 2010 DHS, providing new insight into the inter-urban distribution of environmental health outcomes and their determinants at different levels of the national urban hierarchy. This analysis marks the first time these patterns have been examined in Malawi.

1.2 Introducing the case of Karonga Town

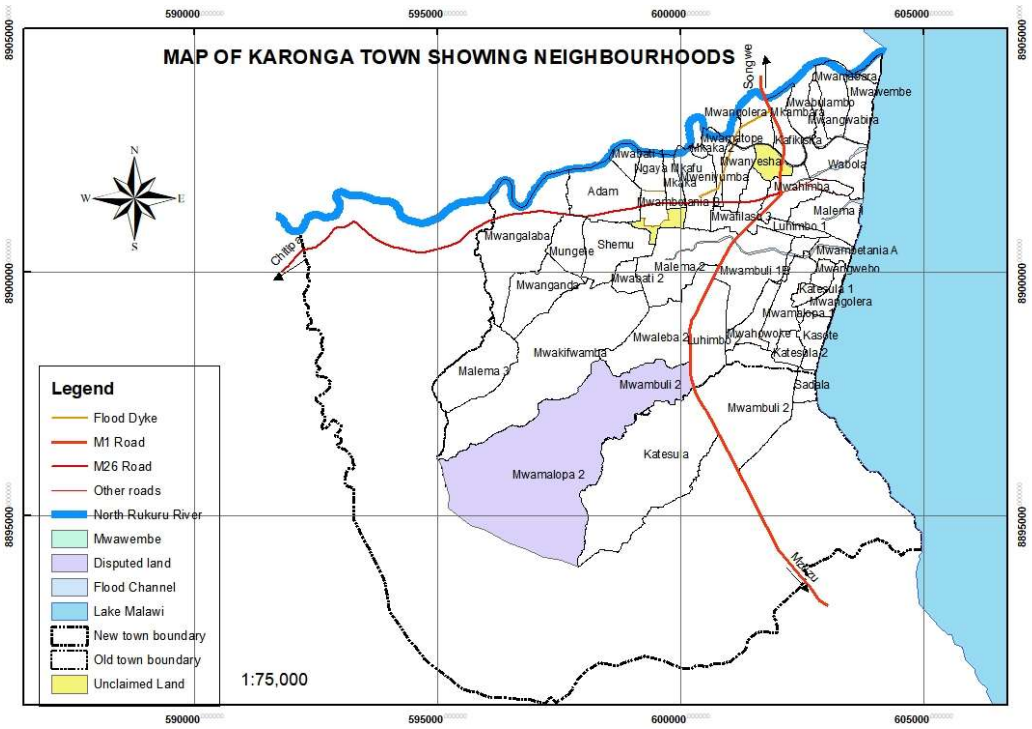
Environmental conditions in Karonga Town suggest that it faces similar challenges to other smaller urban centres in the region: it is rapidly growing without the capacity to plan and manage the process and to adapt to emerging environmental hazards. This section examines these challenges as a basis for introducing the research question and objectives.

Karonga Town is located in Karonga District in the Northern Region of Malawi, on the shores of Lake Malawi and at the mouth of the North Rukuru River (Figure 1.3). The town's old administrative boundary, which originally included 46 villages, was recently expanded to include an additional 13 villages in the town's rapidly expanding periphery (for a list of all villages in the town, see Annex I). Villages in the old boundary were recently mapped as part of a study under Urban ARK, but those in the new boundary have yet to be. Figure 1.4 shows the villages that have been mapped, the old and new administrative boundaries, major roads, flood channels, and the proximity of the town to the North Rukuru River and the lake.

Figure 1.3: Map of urban centres in Malawi, 2004

Source: Department of Peace Keeping Operations, Cartographic Section (2004). Presented in Cammack et al. (2009)

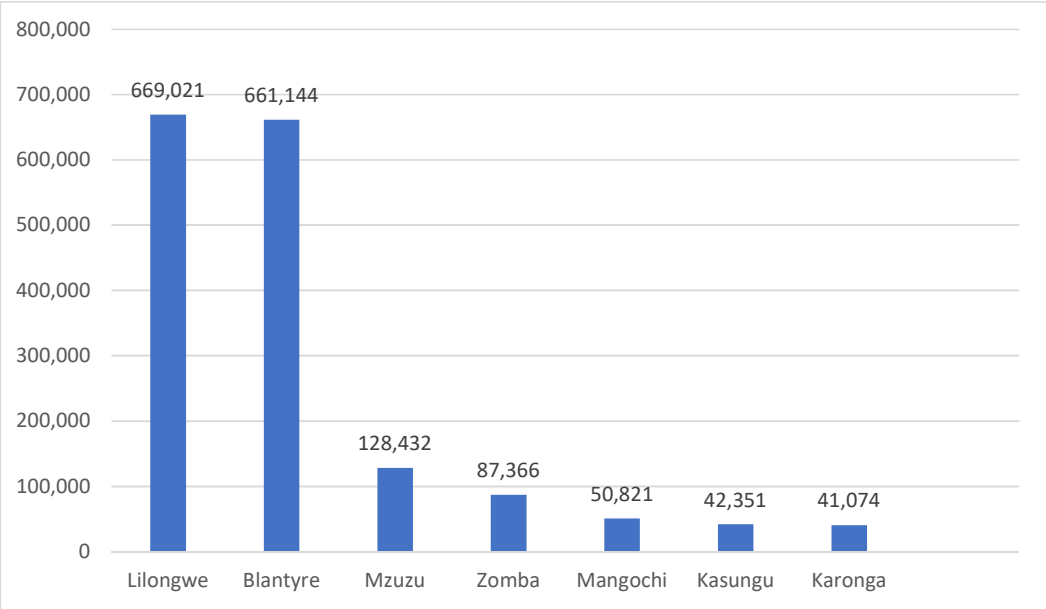
Figure 1.4: Map of Karonga Town, Malawi



Source: Wisdom Bwanali (2018)

Although Karonga Town is small by international standards, with a population of 41,074 in 2008 (the last census year) (NSO 2008), it is the seventh largest urban centre in Malawi, considerably smaller than the three largest cities (Lilongwe, Blantyre and Mzuzu), which along with Zomba account for most of Malawi's urban population (Figure 1.5). While Karonga Town is relatively large, it was not declared a Statutory Planning Area until 1991, by which time its population was already close to 20,000 (Ministry of Lands and Housing 2013). Until then, land in the town was largely allocated by chiefs in accordance with customary law, representing a parallel institution for planning authorities to grapple with (field notes, 2017).

Figure 1.5: Populations of the largest urban centres in Malawi, 2008



Source: 2008 census data presented in NSO (n.d.), compiled by author

Karonga Town is the second largest urban centre following Mzuzu in the North, which is the least populated, urbanised and developed of Malawi's three political regions (South, Central and North) (Manda 2013). Most of Malawi's urban population, urban centres and infrastructure has historically been concentrated in the Southern Region (where Blantyre and Zomba are located) and to a lesser extent the Central Region (where Lilongwe is located) (ibid), as discussed in Chapter Five (section 5.1.1). Karonga Town's size and location combined with its rapid growth of around 5% per year (NSO n.d.) demonstrates its importance as an emerging secondary centre in the North.

Despite its demographic importance, Karonga Town suffers from a severe lack of institutional capacity to plan and manage urban growth in the absence of a functional and elected Town Council, which was dissolved by national government after it suspended local elections for political reasons in 2005 (Manda 2014), as discussed in Chapter Five (section 5.1.5). Consequently, the town's ability to implement its plans and coordinate the many service providers that have emerged to fill the gap remains sorely lacking (ibid). A recent town-wide survey by Manda and Wanda (2017) indicated that 57% of households live in traditional/non-statutory settlements and that over half of all households rely on traditional pit latrines. Poor sanitary conditions combined with the town's high-water table; location of pit latrines, graveyards and stagnant water within 100 metres of shallow wells, boreholes and rivers; indiscriminate waste disposal; open defecation; and lack of proper drainage pose major threats to surface and ground water (ibid).

The capacity to maintain sludge ponds and collect waste from the town's single solid waste collection point (located in the central market) is also lacking (Figure 1.6). Consequently, liquid and solid waste often spill over during the rainy season, a situation made worse by the absence of a functional sewerage and drainage system (Manda et al. 2016). Meanwhile, flooding and waterlogging have worsened due to the inability to maintain the dyke and drainage channels, allowing flood waters from the North Rukuru River to consume the town on a seasonal basis (Figure 1.7 – 1.8). Seasonal flooding from heavy rainfall has become increasingly frequent as well (ibid).

Figure 1.6: The central market's single solid waste collection point

Photo credit: Author (2016)

Figure 1.7: Erosion of the dyke without maintenance

Photo credit: Author (2016)

Figure 1.8: Encroachment on drainage channels

Photo credit: Author (2016)

Poor environmental conditions heighten Karonga Town's vulnerability to physical hazards (floods and droughts, high-winds, earthquakes, lake rise, and heat stress) and biological hazards, including endemic diseases (malaria, dysentery and bilharzia) and epidemic diseases (cholera) (Manda et al. 2016). Between 1946 and 2008, Karonga District as a whole registered the largest number of disasters in Malawi (Runduka et al. 2011). Pollution and water contamination from nearby mining activities pose major public health threats as well (Manda and Wanda 2017).

Together, these hazards form a wide spectrum, encompassing everyday, small and large events, including some that overlap (cholera outbreaks following seasonal floods, damage to the dyke caused by the earthquake contributing to floods). Table 1.4 demonstrates the range of events that impact morbidity, mortality and asset loss in the town.

Table 1.4: Nature, scale and frequency of hazard events in Karonga Town, 2016

Event	Category	Nature of the event	
		Occurrence and frequency	Total impact
Flooding	Small disaster	Every rainy season from 2009 to 2016	50 households, whole central town and settlements along Rukuru river were flooded in 2010; whole town centre was flooded and 14 houses collapsed 6 December 2016
Earthquakes	Large Disaster	Frequently; 4 in December 2009 alone	Entire town affected in 2009; 775 houses collapsed, 1,154 houses developed cracks, many public buildings, businesses and services damaged or destroyed
Droughts/ food insecurity	Small disaster	Drought and food security problems in 2012 and 2014	Drying of crops, death of livestock and 9 and 13 reported deaths due to malnutrition in 2012 and 2014, respectively
Road/traffic accidents	Everyday risk/hazard	Daily basis	Karonga District Hospital reported 5 car accidents in 2016, leaving 5 people dead and 10 injured
Politically linked violence	Small disaster	Periodically, usually during food distribution exercises and political campaigns	Household respondents reported 12 people were injured in run up to 2014 national elections and some houses were burnt
Gender-related violence	Everyday risk/hazard	Daily basis	Respondents reported 10 injuries due to gender-based violence
Drowning in river/lakes	Small disaster	Mainly in rainy season	Respondents said boats often capsized, with several undocumented fatalities
Crocodile/ snake/ animal attacks	Small disaster	Annually, especially in rainy season	Community members indicated that several people were killed or injured along the lakeshore—no specific events reported
Strong winds	Small disaster	Annually, especially in rainy season	Community members indicated roofs blown off scores of houses—no specific event reported
Polluted/ poor water quality	Every day/ Small disaster	Daily basis, but more serious during rainy season	Hospital records indicated 4 deaths due to cholera in 2016
Fish kills/ mortality	Small disaster	Seasonally, especially during temperature inversions and mixing of waters due to currents in Lake Malawi	Respondents reported widespread unexplained death of fish species in Lake Malawi in 2006, 2011 and 2014
Diseases	Everyday risk	Daily basis	Karonga District Hospital reported 30 Tuberculosis related deaths in 2012. 67 Tuberculosis related deaths in 2014 and 13 and 32 deaths from respiratory infections in 2012 and 2014, respectively

Source: Manda and Wanda (2017)

1.3 Research question and objectives

To investigate the problematic above, the study addresses the following research question and objectives:

1.3.1 Research question

- *How is in situ urbanisation influencing the nature and scale of environmental health risks and outcomes in emerging African towns and their prospects for planning healthy urban environments?*

1.3.2 Research objectives

The objectives are intended to complement the research question by addressing attendant aspects of the problem.

1. *To test the hypothesis that smaller urban centres comprise a large and typically growing share of the urban population through an analysis of census data in Malawi*

Before assessing the environmental health situation in smaller Malawian urban centres, it is first necessary to understand how many people live in them, what share of the national urban population they account for, and how fast they are growing in both absolute and relative terms. This objective is based on a recognition that urban researchers and practitioners need precise definitions of urban areas both as a key concept and unit of analysis (Galea and Vlahov 2005a). Here, census data are analysed based on a new urban settlement hierarchy proposed by Manda (2013) in response to the lack of clear criteria used by the National Statistical Office (NSO) to define urban centres and to classify them by size. The hierarchy is used to produce new and more accurate estimates of the share of the urban population living in urban centres of different sizes, from smallest to largest, providing new insight into the demographic importance of settlements at the bottom of the urban hierarchy.

2. *To test the hypothesis that environmental health may be especially poor in smaller urban centres through an analysis of the 2010 Malawi Demographic and Health Survey (DHS)*

This objective examines the urban size dimension of environmental health by comparing indicators for related health outcomes and their determinants between urban centres of different sizes using the four tier settlement hierarchy proposed by Manda (2013) as a sample framework. This objective builds on previous analyses of DHS data (Hewett and Montgomery

2001; Montgomery et al. 2004) reviewed above to determine whether smaller Malawian urban centres may have lower levels of provision of piped water, flush toilets and electricity than their larger counterparts.

3. *To document environmental health outcomes and their socio-spatial distribution in Karonga Town through an analysis of hospital records*

This objective drills down to the urban scale to explore the environmental health situation particular to Karonga Town through an analysis of patient records collected from Karonga District Hospital over a twelve-month period (August 2016 to July 2017). The methodology disaggregates hospital records by age, sex and location to assess the socio-spatial distribution of health outcomes linked to environmental hazards of different sizes (everyday, small and large) and frequencies (recurrent/seasonal and episodic).

4. *To understand the multiplicity of interacting determinants of environmental health in Karonga Town*

This objective assesses the known determinants of the environmental health outcomes documented in the hospital records through an ethnographic analysis of the town's socio-economic, biophysical, institutional and political conditions. The determinants are assessed holistically to understand how they interact in socio-ecological systems shaped by processes of in situ urban change.

5. *To understand the prospects for planning a healthy urban environment in Karonga Town through an analysis of the evolving institutional context in which its urban planning system is embedded*

The final objective explores the urban planning systems that shape the urban environment and the distribution of its quality across the town. Particular attention is paid to the interactions between the different stakeholders as they attempt to influence decision-making both in and outside official arenas, to the conflicts that can arise between customary and modern institutions in emerging urban governance landscapes, and to the consequences for the planning system and, by extension, the urban environment.

It is anticipated that the findings will be of broader relevance to other sub-Saharan African countries facing similar challenges. To provide a way forward, hypotheses are identified from the key findings in Chapter Eleven (section 11.1.3) with the intention of being tested in other contexts, positioning Karonga Town at the forefront of a new research agenda prioritising smaller African urban centres.

1.4 Themes central to the problematic

Five themes are central to the research problematic and together form the study's overarching narrative:

- ***African urbanisation***: The continent is urbanising in exceptional ways relative to other regions;
- ***Smaller African urban centres***: They account for a large and typically growing share of urban growth in the region;
- ***Rural transformation***: Smaller urban centres have the potential to transform rural territories for the benefit of poor rural populations;
- ***Urban risk***: Environmental health hazards threaten to undermine smaller urban centres' growth and development potential; and
- ***Urban planning***: The ability to plan healthy urban environments effectively is a pre-condition for smaller urban centres' growth and development.

This section summarises each theme in order to define the scope of the research both within and beyond Urban ARK. In turn, the themes provide a structure for the literature review in Chapter Two and form the overarching narrative for the thesis.

African urbanisation

This theme addresses the rapidly changing dynamics of African towns and cities, the urban systems of which they are part, and the processes of urban change that are reshaping Africa's emerging urban landscape. A number of common urban trends have been identified across the continent that set it apart from others: low urbanisation levels and high rates of urban growth and urbanisation (Pieterse and Parnell 2014); large share of the urban population living in small and intermediate urban centres (Satterthwaite 2016a); urbanisation with little industrialisation (Fox 2012); limited integration into the global economy (Simon 1997); strong rural-urban linkages (Bah et al. 2003); high rates of natural increase (McGranahan et al. 2009); circular (rural-urban-rural) migration patterns (Potts 2010); urban spatial expansion (Angel et al. 2011); pervasive poverty and informality (Mitlin and Satterthwaite 2013); large infrastructure deficits (Pieterse et al. 2018); colonial histories (Mamdani 1996); vulnerability to environmental and climatic hazards (Parnell and Walawege 2014); and large environmental disease burdens (Smit and Parnell 2012).

While these trends are common, they vary within and between countries and regions, negating generalisations about African urbanisation and urbanism (Rakodi 1997; Pieterse and Parnell

2014; Dodman et al. 2017). Variations are particularly pronounced between North Africa and the sub-continent (Rakodi 1997). North Africa, which has an urban population of 51% in 2010 (UNDESA 2015), has strong cultural, political and economic links to the Middle East and Europe (Rakodi 1997). In contrast, sub-Saharan Africa, which has an urban population of 35% in the same year (UNDESA 2015), has much more in common with itself, notwithstanding regional differences (ibid). To account for these variations, the discussion of African urbanisation in Chapter Two (section 2.1.1) focuses on sub-Saharan Africa, while the discussion of Malawi's urbanisation in Chapter Five (section 5.1.1) focuses more specifically on East Africa. These discussions position Malawi's urban transition in its regional context in order to understand what makes it similar or dissimilar to surrounding countries. The term 'smaller African urban centres' thus refers to those south of the Sahara Dessert.

Smaller African urban centres

This theme addresses the demographic importance of smaller African urban centres, issues pertaining to how they are defined, and the drivers of their growth. As noted above, a large share of sub-Saharan Africa's urban population has historically lived in small and intermediate centres with less than 500,000 people (Satterthwaite 2016a). Many—though not all—are experiencing rapid growth and are thus reported to be contributing significantly to urbanisation (World Bank and IMF 2013).

There are, however, a number of ambiguities surrounding smaller urban centres. Since urban size distributions vary, what may be considered a small town in one country may be considered intermediate in another (Satterthwaite 2006). Their definitions often differ as a result, making it difficult to compare urban size distributions between countries, particularly where census data for individual urban centres are unavailable. The lack of detailed, accurate and reliable census data, combined with the use of ambiguous population thresholds for distinguishing the smallest urban centres from rural areas, mean that current estimates likely under-estimate the share of the region's urban population at the bottom of the urban hierarchy (Montgomery et al. 2004; Satterthwaite 2016a). Any assessment of the demographic importance of smaller urban centres must therefore be based on clear statistical criteria for defining urban centres and categorising them by population size.

There is a similar lack of data on the factors driving the growth of smaller urban centres, although a nascent body of evidence identifies the significance of in situ urbanisation—whereby high rates of natural increase and high rural population densities contribute to the growth of rural villages in to small towns (Africapolis 2009; Christiaensen et al. 2013; Christiaensen and

Todo 2013; Knudsen and Agergaard 2015; Potts 2018). The dynamics of in situ urban growth, their resulting challenges for local governance, and the implications for attempts to plan urban centres once they have already emerged are of particular interest to this study. These dynamics are under-researched, providing an opportunity for this study to contribute much needed knowledge for action.

Rural transformation

This theme addresses the potential of smaller urban centres to transform rural populations and economies through processes of in situ urbanisation. The emerging body of evidence on the relationship between in situ urbanisation and structural transformation—describing the shift away from agricultural (rural) activities to non-agricultural (urban) activities—highlights the potential of smaller urban centres to catalyse rural transformation by attracting rural migrants into the non-farm economy (Africapolis 2009; Christiaensen et al. 2013; Christiaensen and Todo 2013; Knudsen and Agergaard 2015; Potts 2018).

At the same time, there is growing concern that environmental risks linked to poor planning and infrastructure deficits will undermine the transformative potential of smaller urban centres by limiting their ability to attract migrants, retain working age populations and skilled labour, maintain labour productivity, safeguard health, and compete with larger urban centres for investment (Satterthwaite and Tacoli 2003; Christiaensen and Todo 2013; Proctor 2014; Satterthwaite 2016a; Satterthwaite 2017). As Proctor (2014) argues, the potential consequences for rural development are especially significant in sub-Saharan Africa due to its high rural poverty levels, rapid natural rural population growth, and large share of the urban population living in smaller centres. In this context, understanding the transformative potential of smaller urban centres requires an in-depth understanding of the local settings in which they grow and develop, and the roles they play in local social and economic development (Hardoy and Satterthwaite 1986; Satterthwaite and Tacoli 2003).

Urban risk

This theme addresses the full spectrum of risks in the urban environment that damage the health of their populations and so threaten the growth and development potential of smaller African urban centres. Building on the debate on social vulnerability, as discussed above, this study recognises that urban risk is socially constructed and linked not only to people's social identity (e.g. age, gender, ethnicity, income, disability), but also to processes of urban change that interact with the urban social and physical environment to (re)produce risks for the urban

poor and other marginalised groups (Pelling 2003; Pelling and Wisner 2009; IFRC 2010; Adelekan et al. 2015; Brown et al. 2017; Dodman et al. 2017; Fraser et al. 2017; Levy 2018). Urban ARK has made an important contribution to this debate by emphasising "the multiple and complex ways in which risk and urban development are intertwined in the region" (Fraser et al. 2017: 107) and the context-specific nature of urban risk trajectories (ibid: Dodman et al. 2017; Wisner 2017).

While Satterthwaite (2016a) reminds us of the demographic importance of smaller urban centres, he warns of the governance crisis many are facing in the absence of sufficient institutional capacity, and the consequences for urban risk (see also Satterthwaite 2017). As stressed above, far more needs to be understood about how the urban development trajectories of smaller African urban centres are influencing their risk profiles.

Urban planning

This theme explores evolving efforts to plan healthy urban environments in sub-Saharan Africa. Most attention to the subject has been paid to the negative impacts that urban planning systems inherited in the colonial era have had on reinforcing socio-spatial divides in African cities (Swanson 1968; Swanson 1977; Parnell 1988; Mabogunje 1990; Aina 1997; Rakodi 1997; Watson 2009; Home 2010; Berrisford 2011). Swanson (1977) argues that urban planning in the colonial era was based on a societal metaphor that viewed infectious disease in terms of racial differences between natives and Europeans (the 'sanitation syndrome'), and that this metaphor motivated the adoption of urban policies of racial segregation. Others argue that despite the racism inherent in colonial planning systems, few have been reformed in the post-independence era, and those that have often continue to reflect colonial attitudes toward urban development (UN-Habitat 2009; Watson 2009; Berrisford 2011; Watson 2011). It is thus questionable whether urban planning systems, in their current form, are capable of responding to the challenges of Africa's urban transition.

At the same time, however, urban planning is increasingly recognised as central to health promotion and disease prevention given its role in determining access to quality housing on safe and serviced land; safeguarding the natural environment from inappropriate urban development; regulating land use; and shaping the built environment and urban form (GRNUHE 2010; Smit et al. 2011; Smit and Parnell 2012). Traditionally, the debate on urban planning has focused more on the technical aspects of plan implementation without critically reflecting on the extent to which existing plans and their supporting regulatory frameworks are appropriate in situations where urban growth is rapid and institutional capacities low, where informality is

the dominant mode of urban development, and where decision-making is influenced by a range of stakeholders, of whom planners are only one (UN-Habitat 2009; Watson 2009). In such situations, planning's effectiveness is determined in large part by local socio-economic realities (particularly regarding the ability to afford the costs of complying with building codes and standards) and the interests of governing elite, who may not see the value of planning if it impedes their interests or is seen as an impediment to development (Watson 2009).

Of particular interest here are the power dynamics shaping urban planning and decision-making in smaller settlements. Evidence indicates that state-community relations are being transformed by processes of in situ urbanisation and giving rise to new local governance challenges. Such processes have been observed in the Southern Region of Malawi where rural villagers surrounding towns are simultaneously subject to modern and customary rule (Eggen 2011). This study explores how in situ urban change is destabilising the rural/urban axis conventionally used to distinguish between customary (rural) institutions and modern (urban) institutions at the bottom of the urban hierarchy. The changing nature of state-society interactions in small towns has received little attention in the literature on local governance and urban change. Most efforts to understand Africa's urban governance challenges have focused on the largest cities (for example, Rakodi 1997, 2006), with a smaller strand focusing on the peri-urban interface (for example, Simon et al. 2004).

This study seeks to expand this literature to engage with the growth dynamics of emerging towns in Africa's urbanising landscape and the rural governance transformations that are arising as a result. Particular attention is paid to the evolving relationship between existing customary institutions based on the traditional chieftaincy structure and modern institutions based on formal rules and regulations, of which urban planning constitutes a key part. The place-based dynamics of rural governance regime change associated with processes of in situ urban change have yet to be systematically investigated, marking an opportunity for this study seeks to shed new insights into the nature of these dynamics and their implications for environmental health in emergent African towns.

1.5 Structure of the thesis

The thesis is comprised of eleven Chapters. This Chapter explains this study's contribution to Urban ARK and beyond by discussing the project's key points of departure that this study seeks to expand. Chapter Two reviews themes that are central to this problem, as identified in section 1.4. Chapter Three develops a new analytical framework to guide the analysis of the research

problem. Chapter Four outlines the research methodology, including the study design, data collection methods, limitations and ethical issues.

The following Chapters present the empirical evidence. Chapter Five provides a detailed description of Malawi and the historical and contemporary processes of change shaping its late urban transition in the East African context. It then offers a parallel description of Karonga Town in order to contextualise its position in the national urban system and observe its evolving urban condition. Chapter Six presents new estimates of the share of Malawi's urban population living in urban centres of different sizes through an analysis of census data in order to test the hypothesis that a large and typically growing share of the urban population lives in smaller urban centres. Chapter Seven compares environmental health outcomes and their determinants among urban centres of different sizes through an analysis of the 2010 Malawi DHS in order to test the hypothesis that environmental health may decline the smaller the urban size.

Moving to the urban scale, Chapter Eight documents environmental health outcomes in Karonga Town through an analysis of hospital records in order to test the hypothesis that health may be strongly linked to environmental hazards in smaller centres. Chapter Nine identifies the determinants of the environmental health outcomes identified as most prevalent in Chapter Six through an exploration of local socio-economic, environmental, institutional and political conditions, and their complex interactions. Chapter Ten explores the institutional context for Karonga Town's planning system and its prospects for planning a healthy urban environment.

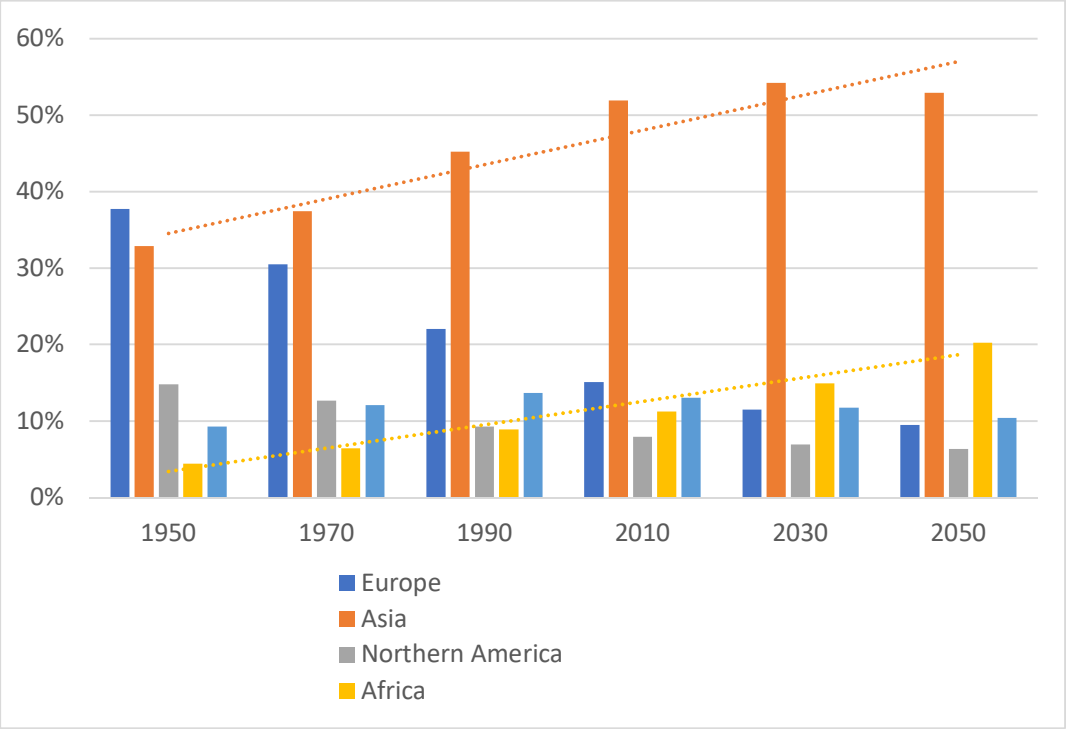
The final Chapter synthesises the major findings of the study and discusses the main contributions to theories of urban planning and governance in smaller African towns. The implications for future research and practice are then drawn out to better understand and address the prospects for planning healthy environments in this context. The Chapter concludes by contemplating the future of Karonga Town as an emerging secondary centre in Malawi and the potential lessons its offers for other sub-Saharan African countries facing similar demographic, environmental and institutional challenges.

Chapter 2 Literature review

The evidence presented in the previous Chapter indicates that the populations of smaller African urban centres may face wide-ranging environmental health risks linked to inadequate infrastructure and service provision (particularly water, sanitation and electricity) and the absence of local authorities capable of fulfilling their responsibilities. That environmental conditions in smaller urban centres may be generally poor is problematic not only from a public health perspective given the large share of the world's urban population they account for, but also from an urban planning perspective given the large share of future urban growth they are expected to accommodate and from a rural planning perspective given the roles many play in supporting the lives and livelihoods of the rural poor (Satterthwaite and Tacoli 2003).

Despite the scale of this problem, current frameworks designed specifically to understand the health impacts of urban living are insufficiently grounded in the experience of Africa and other developing country contexts. Most are grounded in the histories and geographies of Europe and North America where urban health issues, such as air pollution and physical inactivity, linked to low-density patterns of urban development ('sprawl') have attracted increasing attention in academic and policy circles (for example, Frumkin 2002; Northridge et al. 2003; Northridge and Sclar 2003). These frameworks are disconnected from the dynamics of the global urban transition. While populations in Europe and North America—as well as Latin America and the Caribbean and Oceania—are now predominately urban (UNDESA 2015), the majority of the world's future urban growth is set to occur in Asia and Africa, which already contain most of the world's urban population, despite being the least urbanised (Figure 2.1).

Figure 2.1: Share of world's urban population by region, 1950-2050



Data from UNDESA (2015), compiled and presented by author

The world's future urban health challenges will therefore be increasingly concentrated in developing regions in the earlier stages of their urban transitions (Galea et al. 2005; Vlahov et al. 2007; Kjellstrom and Mercado 2008; Smit and Parnell 2012). These challenges are different from those in Europe and North America where the 'epidemiological transition' has led to a decline in the relative importance of infectious and parasitic diseases linked to industrial development and increases in urban living, and to a gradual upturn in the importance of non-communicable diseases linked to outdoor air pollution and unhealthy lifestyles (McKeown 2009; WHO 2016). In much of Africa, infectious and parasitic diseases (e.g. malaria, respiratory illnesses, diarrhoea) and accidents (e.g. road traffic injuries, fires, burns, scalds and cuts) account for a large share of ill-health, death and disability and are strongly linked to environmental hazards (e.g. poor housing, drainage, water and sanitation, and inadequate liquid and solid waste management) that tend to concentrate in deprived urban localities, such as informal settlements (Cairncross 1988; Hardoy et al. 2001; Harpham 2009; Smit and Parnell 2012; Lilford et al. 2017).

Africa is, however, only beginning to be recognised as a vital research area given its prevalence of urban health inequities, which, as Oni et al. (2016) argue, "have not yet emerged as major research and policy priorities in Africa" (ibid: 722). This Chapter seeks to contribute to the

prioritisation of Africa in urban health research by framing the importance of smaller African urban centres in the region's urban transition.

The Chapter reviews the literature surrounding the themes identified in Chapter One (section 1.4) as central to the research problematic—i.e. to understand how processes of in situ urban change are influencing the nature and scale of environmental health risks and outcomes in emerging African towns and the prospects for planning healthy urban environments in these increasingly important urban contexts.

2.1 Key themes and overarching narrative

Several themes are central to the research problematic and are developed to form the overarching narrative introduced in Chapter One (section 1.4). To recap, the themes are:

- ***African urbanisation***: This theme addresses the rapidly changing dynamics of African towns and cities and the urban systems of which they are part. It recognises that the continent is urbanising in exceptional ways relative to other regions;
- ***Smaller African urban centres***: This theme addresses the demographic importance of these centres, the way in which they are defined, and the drivers of their growth. It recognises that smaller urban centres account for a large and typically growing share of urban growth in the region;
- ***Rural transformation***: This theme addresses the potential of smaller African urban centres to transform rural areas through in situ urbanisation. It recognises that the prevailing focus on agglomeration in the largest cities is narrow and potentially misguided in countries where a large share of the urban population lives in smaller centres;
- ***Urban risk***: This theme addresses the spectrum of health risks in the urban environment that threaten the growth and development potential of smaller African urban centres. It recognises that these centres are becoming increasingly urgent priorities for urban planning, public health and disaster risk reduction (DRR); and
- ***Urban planning***: This theme explores evolving efforts to plan healthy urban environments in sub-Saharan Africa in the colonial and post-colonial eras. It recognises that current approaches to urban planning are outmoded and need to be reformulated if they are to be relevant in the twenty-first century.

2.1.1 African urbanisation

With an estimated urbanisation level of 35% in 2010 and an annual urbanisation rate of around 1%, sub-Saharan Africa is reported to be the world's least urbanised, and one of the most rapidly urbanising regions (UNDESA 2015). By 2040, its population is expected to become predominately urban, adding 640 million people to its towns and cities in just three decades (ibid). While the question of African urban exceptionalism raised by Fox (2012) and others (Pieterse and Parnell 2014) negates generalisations, there are common trends regarding the timing, pace and scale of urbanisation that need to be understood. This section examines these trends and the forms of urbanisation they are contributing to.

The timing of urbanisation

Except for parts of Asia, Africa's urban transition has been delayed relative to other regions (Pieterse and Parnell 2014). Prior to independence, colonial Africa was predominately rural and the urban centres that did exist were either traditional villages or small colonial towns (ibid). It was not until the later stages of colonial rule at the onset of World War II that the number of urban centres began to grow considerably (Freund 2007; Fox 2011, 2014). During this period, African urban centres grew in size (Table 2.1) as did their contribution to the continent's urbanisation level, which increased from 14% in 1950 to 35% in 2000 (UNDESA 2015).

Table 2.1: Population of some African cities and towns in the colonial era, 1900-1960

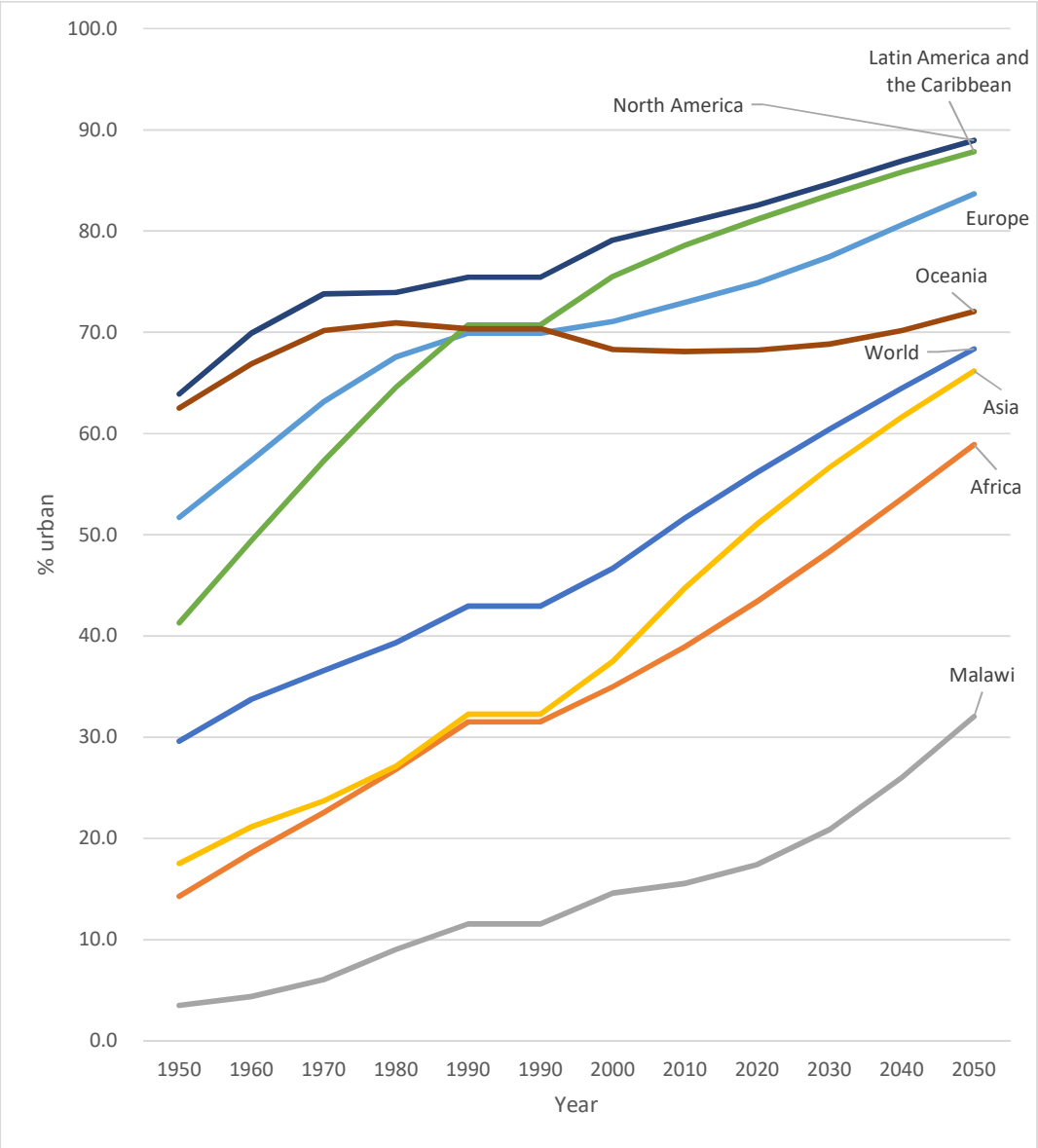
Urban centre	Population (in thousands) by year		
	c. 1900	c. 1939	c. 1960
Cairo (Egypt)	910	1,312 (1937)	2,852 (1959)
Alexandria (Egypt)	--	686 (1937)	1,335 (1959)
Johannesburg (South Africa)	102 (1896)	283 (1931)	1,097 (1959)
Casablanca (Morocco)	20 (1897)	283 (1931)	961 (1960)
Algiers (Algeria)	--	264 (1963)	834 (1960)
Ibadan (Nigeria)	210 (1900)	387 (1931)	600 (1960)
Accra (Ghana)	18 (1901)	61 (1931)	491 (1960)
Addis Ababa (Ethiopia)	35 (1908)	300 (1938)	449 (1961)
Léopoldville (Belgian Congo)	5 (1908)	27 (1935)	420 (1961)
Tunis (Tunisia)	146 (1901)	220 (1936)	410 (1956)
Dakar (Senegal)	18 (1904)	92 (1936)	383 (1960)
Lagos (Nigeria)	74 (1910)	127 (1931)	364 (1960)
Three cities, including Khartoum (Sudan)	77 (1905)	176 (1938)	300 (1961)
Nairobi (Kenya)	12 (1906)	119 (1948)	267 (1962)
Tananarive (Madagascar)	50 (1900)	142 (1945)	248 (1960)
Luanda (Angola)	20 (1900)	51 (1930)	220 (1960)

Bulawayo (South Rhodesia)	--	53 (1946)	195 (1961)
Kumasi (Ghana)	19 (1911)	--	190 (1960)
Elisabethville (Belgian Congo)	--	--	190 (1960)
Mombasa (Kenya)	30 (1906)	1985 (1948)	190 (1960)
Lourenco Marques (Mozambique)	10 (1904)	47 (1935)	184 (1961)
Abidjan (Ivory Coast)	1 (1910)	17 (1936)	180 (1960)
Kano (Nigeria)	30 (1903)	89 (1931)	176 (1960)
Douala (Cameroun)	--	28 (1931)	150 (1961)
Dar es Salaam (Tanganyika)	25 (1906)	69 (1948)	140 (1962)
Brazzaville (French Congo)	5 (1900)	24 (1936)	129 (1961)
Freetown (Sierra Leone)	34 (1911)	65 (1947)	125 (1960)
Bamako (French Soudan)	7 (1910)	37 (1945)	120 (1960)
Conakry (Guinea)	6 (1910)	26 (1945)	113 (1960)

Data source: compiled by Freund (2007)

Prior to the 1950s, urban centres had existed in Africa for more than 2,000 years (Anderson and Rathbone 2000). Figure 2.2 shows that Africa's urban transition did not begin until the middle of the nineteenth century, and that the continent is expected to remain the least urbanised well into the twenty-first century. The Figure also shows that Malawi is considerably less urbanised than Africa's population as a whole, signifying its relatively late urban transition, as discussed in Chapter Five (section 5.1.1).

Figure 2.2: Share of population living in urban areas by region, 1950-2050



Data from UNDESA (2015), compiled and presented by author

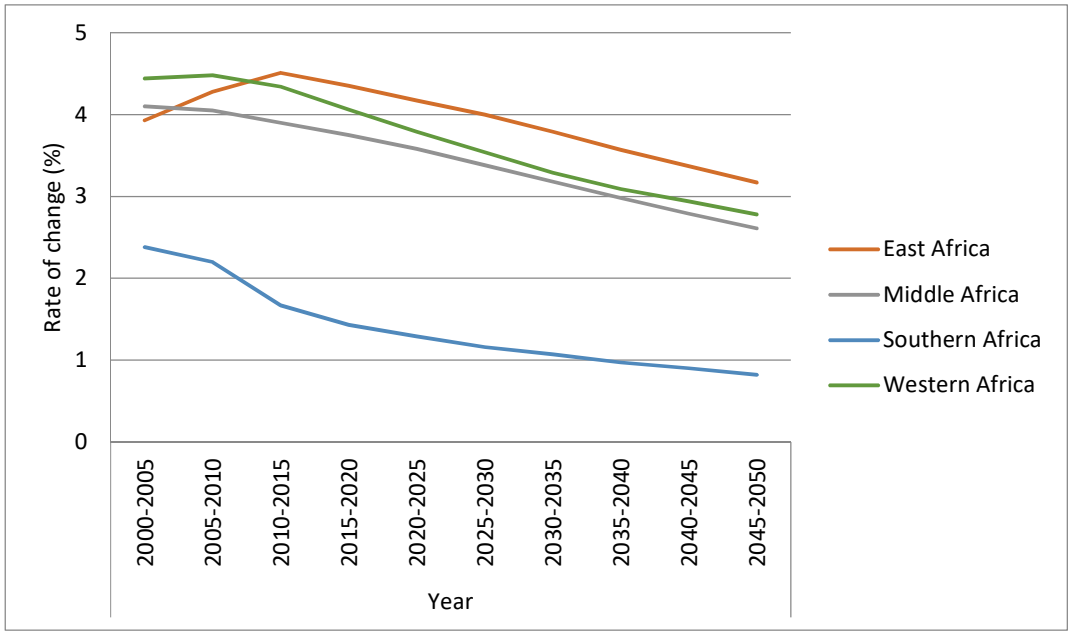
African towns and cities now form a spectrum, encompassing a growing number of very large cities and countless numbers of small towns and cities and rural market centres (Pieterse and Parnell 2014; Satterthwaite 2017). Their populations have grown to the extent that they now exceed those of North America and are expected to surpass those of Europe by 2020 (UNDESA 2015). Until recently, however, Africa was thought of as a predominately rural continent (Pieterse and Parnell 2014). Researchers have since become increasingly keen to demonstrate the pace of Africa's urban transition and its drivers.

The pace of urban growth and urbanisation

Current estimates indicate that urban growth rates in the region are the highest in the world at above 3% per year due primarily to natural increase associated with high fertility rates (UNDESA 2015). Rural-urban migration accounts for a much smaller share (around one-third) of urban growth than natural increase, challenging popular claims among officials that urban growth is being driven by the rapid influx of (poor) rural migrants into African towns and cities (Potts 2012; McGranahan et al. 2009). Experience demonstrates that natural increase tends to play an increasingly important role as the urbanisation process unfolds, with rural-urban migration playing a more significant role in the initial stages (Cohen 2006).

While the populations of many African town and cities are expanding, projections indicate that urban growth rates have been falling overall since 2010, especially in Western and Southern Africa, suggesting that urban growth rates may have already peaked (Figure 2.3). Potts (2012) argues that this downward trend corresponds with increasing rates of circular migration (rural-urban-rural) accompanying decades of urban economic instability, which has decreased the relative contribution of rural-urban migration to urban growth and urbanisation. This trend is well-documented in francophone West Africa (see Beauchemin and Bocquier 2004). Therefore, while the urban population may be growing, albeit at a declining rate, it is not necessarily urbanising, despite the rapid growth of many towns and cities. Popular claims that urbanisation rates in the region are rapid thus need to be treated with caution, particularly in the absence of reliable and up-to-date census data for many countries (Potts 2012).

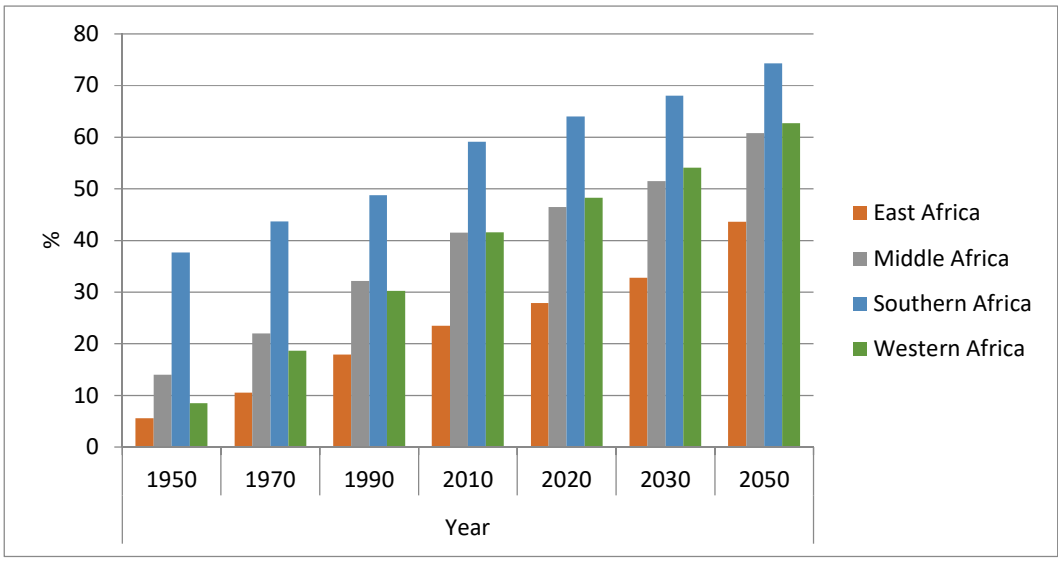
Figure 2.3: Average annual rate of change in the urban population by region in sub-Saharan Africa, 2000-2050



Data from UNDESA (2015), compiled and presented by author

Sub-Saharan African countries that are reported to be urbanising are not doing so uniformly. In 2010, the least urbanised region was East Africa (in which Malawi is located), followed by Middle and Western Africa (Figure 2.4). While urbanisation rates are expected to decline overall, several countries, including Malawi, Chad, Comoros, Mozambique, Niger, Sierra Leone and South Sudan, are expected to have increasing rates (UNDESA 2015), as discussed in Chapter Five (section 5.1.1). Regional variations in urban transitions thus render generalisations problematic.

Figure 2.4: Differences in urbanisation levels between regions in sub-Saharan Africa, 1950-2050



Data from UNDESA (2015), compiled and presented by author

The drivers of urbanisation

Demographic drivers

Urbanisation is generally driven by two demographic factors: (a) net rural-urban migration (the initial cause of urbanisation); and (b) the statistical re-classification of rural settlements as 'urban' (McGranahan and Satterthwaite 2014). These factors contribute to the increasing share of the total population living in urban areas (urbanisation), whereas natural increase (the excess of live births over deaths, or when birth rates exceed mortality rates) contributes to the absolute growth of the total urban population (urban growth) (Satterthwaite 2007). It is important to distinguish between urbanisation and urban growth (they are not the same) (ibid).

To date, most scholarly and practical attention to Africa's urban transition has been paid to rural-urban migration. Scholars led by Potts (2012) have sought to demonstrate that migration from the countryside accounts for a much smaller share of urban growth and urbanisation than currently thought. Much less attention has been paid to the role of natural increase in Africa's urban transition. One of the ways in which natural increase contributes to urbanisation is through stimulating the growth of rural villages into towns, resulting in their statistical reclassification as urban—a process dubbed 'in situ urbanisation' (Africapolis 2009). Although the process has been documented primarily in China (see Zhu 2002), it is attracting increasing attention among scholars focused on rural transformation in Africa (Africapolis 2009; Christiaensen et al. 2013; Proctor 2014; Potts 2018), as discussed below (section 2.1.3).

Economic drivers

Various economic theories have been proposed since the 1950s to explain the drivers of Africa's urban transition. The prevailing theory in academic and policy circles centres on the relationship between structural transformation and the spatial location of labour (Fox 2012). It posits that the modern urban sector will absorb surplus labour from the agricultural (rural) economy by drawing people into towns and cities in search of higher wages, as supported by the 'Lewis' model (Lewis 1954). This model assumes that urbanisation is driven primarily by rural-urban migration at the beginning stages of industrialisation.

Debates later emerged from the observation that urbanisation levels in many developing countries exceeded wage-based urban economic activities—a phenomenon dubbed 'over-urbanisation' (Davis and Golden 1954). Various explanations of this contradiction have been offered over the decades. Harris and Todaro (1970) proposed that over-urbanisation was attributable to migration decisions based on expected rather than actual wages in the urban sector, but studies using the Harris-Todaro model have produced inconsistent results (see Lall et al. 2006). Other studies indicate that the decision to migrate is influenced by non-economic motives, including the desire of young people to escape older generations in the village (see Becker and Morrison 1995) and by war and climate change (see Barrios et al. 2006; Parnell and Walawege 2011).

In the 1990s, the World Bank (Fay and Opal 2000) suggested that urbanisation in Africa was occurring 'without growth', based on statistics showing sustained urbanisation in many sub-Saharan African countries in spite of poor economic performance. Other studies counter this argument by drawing on data showing a relationship between urbanisation and human development indicators (see Kessides 2005). The evidence generally indicates that, while Africa's urban transition has occurred with varying degrees of economic growth and development, the benefits have been largely squandered by ineffective urban management, manifested by the proliferation of informal settlements, unemployment (particularly among youth) and declining urban incomes (ECA 2012; Turok and McGranahan 2013; Parnell and Pieterse 2014).

More recent accounts have been more optimistic about economic growth in the region, including a number of reports by private think tanks, such as the McKinsey Global Institute (2012), Hatch et al. (2011), Monitor (2009) and the World Bank (2009a). These reports are optimistic about the potential of economic growth to enlarge the middle-class, thus promoting the diversification of African economies, and the role of cities as engines of growth and

development. It is argued that if governments invest in the right kinds of connective infrastructure, they can attract foreign direct investment, particularly in the largest cities, and expand their markets and economies. The evidence demonstrating the links between urban agglomeration and economic growth and development in sub-Saharan Africa is thin, however. While the region has the fastest urban growth rates in the world, most countries remain structurally trapped in deeply unhealthy conditions that negatively impact on economic productivity, efficiency and market growth (Stren and White 1989; Simon 1997; Fox 2011; Parnell and Pieterse 2014).

Technological and institutional drivers

Alternative theories of the links between urbanisation and economic growth have emerged from demography. Cohen (2006) shows that initial reductions in mortality raise the rate of natural increase and that urban populations grow regardless of whether rural-urban migration is occurring. Building on Cohen, Fox (2012) points out that urbanisation in Europe and North America did not begin until the institutionalistion of sanitary reforms, which led to increases in life expectancy, as observed in British cities in the nineteenth century (Szreter and Mooney 1998), discussed below. Because death rates initially exceeded birth rates, cities became 'demographic sinks', meaning their populations needed to be maintained by rural-urban migration (see Dyson 2011). As Fox (2014) argues, "The disease constraint on urban growth also helps explain the mechanism linking the demographic transition to urbanisation by identifying mortality decline stimulated by disease control as the demographic dynamic of greatest causal significance… In other words, mortality decline is a necessary precondition for urbanisation and urban growth to occur" (ibid: 262).

Following historical demographers such as Diamond (1997), Fox (2011, 2014) attributes Africa's late urban transition to the continent's geographic constraints, including its climate, topography, soils and prevalence of infectious and parasitic disease vectors, and to the alleviation of these constraints on urbanisation when the British Colonial Administration began to invest in programmes to combat infectious disease, develop transport infrastructure, catalyse commodity production, and introduce drought resistant agricultural technologies, such as cassava. Despite these interventions, however, urbanisation remained low due to restrictions imposed by colonial administrations on African mobility and urban residence (Home 2010).

The drive for modernisation by colonial governments to prepare the continent for independence after World War II led to new investments in health services (such as vaccines) and education, infrastructure provision, and industrial development (Iliffe 2007). Immunisation programmes

led to large reductions in infant mortality, while transportation and agricultural programmes led to reductions in famine-related mortality, resulting in rapid population growth (Fox, 2011, 2014). At the same time, the elimination of restrictions on mobility combined with an increase in urban employment opportunities led to a sharp increase in rural-urban migration, although urban governments could not keep pace with rising demand for housing and infrastructure, resulting in worsening urban environmental conditions, especially in informal settlements (Home 2010). Economic growth reached record heights between 1960 and 1975, leading to further urbanisation and urban growth (Fox, 2011, 2014).

The economic crisis that emerged in the 1980s, following the global recession combined with poor macroeconomic conditions, deteriorating terms of trade, and the imposition of structural adjustment programmes[1], led to declining economic growth (Simon 1997; Potts 2008). In spite of these conditions, urbanisation and urban growth remained generally high in the region, with some exceptions, notably Zambia, which de-urbanised in the 1980s and 1990s (Potts 1985a). Fox (2011, 2014) attributes sustained urbanisation and urban growth to continued mortality decline, and increasing aid and surplus expansion. He argues that the technological and institutional changes that promote disease control and food security, and hence mortality decline and surplus expansion, are the initial drivers of urbanisation, that such changes also positively influence economic growth, but that economic growth is not necessarily a precondition for urban growth given the non-economic motives to migrate.

Despite recent advancements in the debate, however, economic theory has returned to a focus on the links between economic growth and urbanisation, this time hypothesising that the growth of the largest cities has significant potential to catalyse economic growth due to the theoretical benefits associated with agglomeration, a view popularised by the World Bank (2009a). The Bank has come under heavy fire from geographers (see Rigg et al. 2009) for proposing universal policy solutions in spite of regional variations in the global urban transition. Of particular concern here is the lack of attention paid to the large share of Africa's urban population in smaller centres and their potential to catalyse rural transformation (see Christiaensen et al. 2013; Christiaensen and Todo 2013; Proctor 2014; Knudsen and Agergaard 2015; Potts 2018), as discussed below.

[1] Structural adjustment was supported by the International Monetary Fund (IMF) and the World Bank to restructure low-income economies by growing rural and agricultural sectors and decreasing public expenditure in basic service provision at the expense of urban management (Stren and White 1989).

Forms of urbanisation

In addition to the drivers of African urbanisation, there is increasing interest in the forms that the process is resulting in. Four forms stand out in the literature: urban concentration; extended urbanisation; peri-urbanisation; and in situ urbanisation. While the first three are relatively well-documented, the fourth is not. This discussion seeks to sheds light on the situ growth of settlements at the bottom of the urban hierarchy as a distinct and increasingly important form of Africa's urban transition.

Urban concentration

Urban concentration describes the phenomena of urban primacy whereby the majority of a country's urban population lives in one large city, usually the capital. Primate cities have traditionally dominated urban size distributions in sub-Saharan Africa, a phenomena attributed to the concentration of colonial administrative facilities in capital cities (O'Connor 1983; Freund 2007; Myers 2011; Pieterse and Parnell 2014). Many primate cities have continued to grow in size and at rates exceeding those of secondary towns (Simon 1997; Montgomery et al. 2004). This trend has been attributed to the relative lack of attractive alternative destinations for migrants seeking income-earning activities (Jamal and Weeks 1993), as discussed in the following section. However, while a large share of sub-Saharan Africa's urban population is reported to live in the largest cities, they are small relative to those in other developing regions, notably Asia, which accounts for the largest number of the world's largest cities (UNDESA 2015).

Common problems associated with urban primacy in sub-Saharan Africa include rapid urban growth in the context of low levels of development, widespread poverty and inequality, and limited institutional capacity to engage in urban planning and management, including basic service provision, resulting in the proliferation of informal settlements and consequent environmental problems of urban poverty (Mabogunje 1990; Stren and White 1992; Rakodi 1997; Montgomery et al. 2004; McGranahan et al. 2009; Mitlin and Satterthwaite 2013). The scale of these problems reflects an urban imbalance characterised by the inequitable distribution of wealth, access to resources and the benefits of urbanisation (UN-Habitat 2010a).

Extended urbanisation

Extended urbanisation describes metropolitan regions with expansive spatial footprints transcending numerous administrative areas and jurisdictional boundaries, including those encompassing surrounding cities (Satterthwaite 2010). This horizontally extended and polycentric form of urbanisation is particularly evident and well documented in Asia, the region

with the world's largest number of mega cities and mega city regions (UNDESA 2015). While sub-Saharan Africa has a growing number of extended metropolitan regions, there are relatively few of them, with the exception of Lagos (Nigeria), Accra (Ghana), Dakar (Senegal), Johannesburg (South Africa) and several others. Regional urban development corridors have also begun to emerge, including the Brazzaville-Kinshasa urban corridor in the Congo and the Luanda-N'Djamena urban region in Angola (UN-Habitat 2010b).

Urban authorities in both countries face major planning and governance challenges linked to urban sprawl, lack of cross-jurisdictional coordination, and the proliferation of stakeholders (including different levels of government, civil society and the private sector) involved in urban planning and development (ibid).

Peri-urbanisation

The rapid expansion of cities in sub-Saharan Africa, as elsewhere in the global South and the world more generally, has attracted increasing interest in the transitional zone between urban and rural areas referred to as the peri-urban interface/rural-urban fringe/peri-urban zone (Mbiba and Huchzermeyer 2002; Simon 2008; Mabin et al. 2013). Interest in this zone emphasises the limitations of the rural/urban dichotomy in obscuring settlement patterns that are neither fully urban nor rural (Allen 1999; McGregor et al. 2006; Simon et al. 2006; Simon 2008), as discussed in the following section.

The urban transformations occurring in peri-urban areas are being driven by various dynamics, ranging from the migration of people from rural areas in search of income-earning opportunities, to the out-migration of people from cities in search of cheaper rents and opportunities for land acquisition, to urban development policies supporting low-cost housing projects and resettlement programmes, to the relocation of industry and the development of new commercial parks, to foreign investment by the diaspora in housing development and by private developers seeking to capitalise on emerging real estate markets (Allen et al. 1999; Grant 2009; Mabin et al. 2013).

Peri-urbanisation is contributing to socio-economic, environmental and institutional problems associated with, in particular, a lack of capacity to plan and manage urban expansion, leading to haphazard forms of development (or 'sprawl'); the conversion of agricultural land into residential and commercial uses, displacing the livelihoods of poor farmers; the commercialisation of communal and customary land markets, resulting in more individualised

forms of land tenure and the loss of usufructuary rights[2]; and the existence of different jurisdictions and administrative units, leading to the formulation of piecemeal strategies for urban planning and environmental management (Allen et al. 1999; Mattingly 1999; Deininger and Feder 2000; Simon 2008; Wehrmann 2008; McCarney 2010). As peri-urban areas have become more attractive to migrants and new investment, access to land has become largely dependent on purchasing power rather than membership to a land-owning community (Wehrmann 2008), causing the poor to be displaced to increasingly peripheral and marginal locations (Allen et al. 1999). This spreadout form of urbanisation is becoming increasingly important as towns and cities continue to expand and as density levels continue to decline in much of the world, including sub-Saharan Africa (Angel et al. 2011).

In-situ urbanisation

In-situ urbanisation is understood here as the placed-based transition from a rural area into an urban one. Demographically, this process is driven by high rates of natural increase and high population densities, propelling the growth of villages into towns (Africapolis 2009). In situ urbanisation is thus a profoundly bottom-up process and is likely of growing importance given sub-Saharan Africa's low urbanisation level, meaning that many towns have yet to emerge. As villages grow into towns, many will be re-classified as urban, thus raising national urbanisation levels. Re-classification has historically been a major driver of urbanisation in the region due to the proliferation of small towns (McGranahan et al. 2009), a trend that is expected to continue given the large and typically growing share of future urban growth that is expected to occur at the bottom of the urban hierarchy (Satterthwaite 2016a), as discussed in the following section.

Little is known about the dynamics of in situ urban growth in sub-Saharan Africa due to a lack of detailed census data and empirical research, as discussed in Chapter One (section 1.4). In the context of Malawi, with specific reference to Karonga Town, this study seeks to address this gap through an in-depth exploration of the demographic importance of small towns in the national urban system, the local governance challenges facing efforts to plan the growth of towns after they have already emerged, the conflicts that can arise between modern government institutions and customary institutions in urban planning and decision-making processes, and the consequences for the quality of the urban environment and related health risks and outcomes.

[2] Usufrcutuary rights entitle members of land-holding communities to use any vacant land under communcal/customary control for residential or agricultural purposes in perpetuity.

2.1.2 Smaller African urban centres

It is commonly assumed that most of sub-Saharan Africa's urban population lives in the largest cities and that they are the fastest growing (McGranahan and Satterthwaite 2014). Urban primacy characterises many countries in the region as a direct reflection of colonial settlement patterns, as discussed above (O'Connor 1983; Freund 2007; Myers 2011; Pieterse and Parnell 2014). Countries with the largest number of cities with more than 250,000 inhabitants in 2010 included:

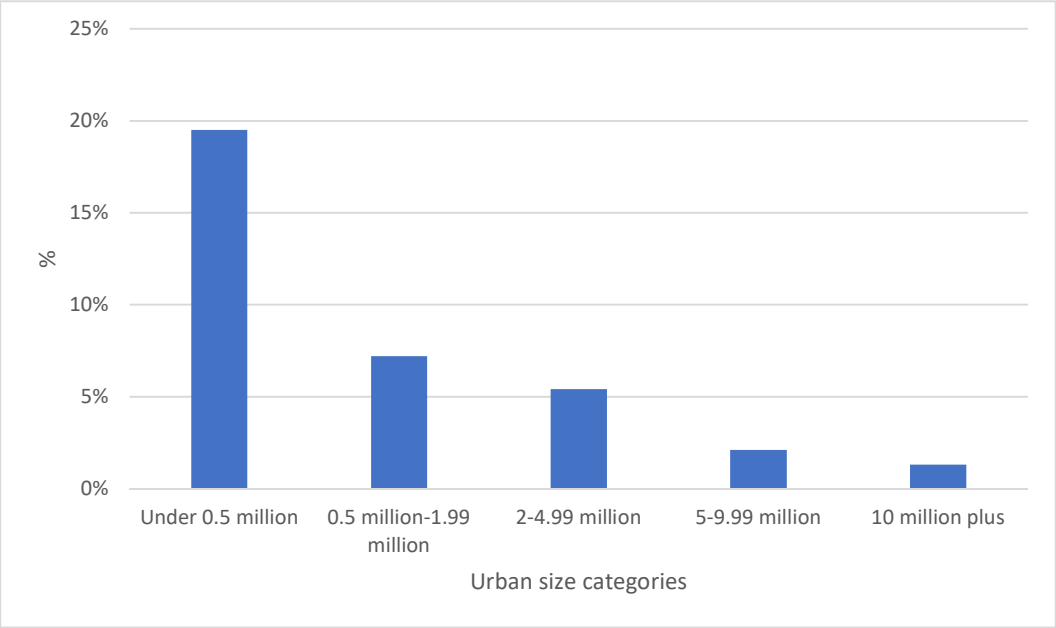
- Nigeria: 42
- Democratic Republic of the Congo: 15
- South Africa: 12
- Cameroon: 6
- Somalia and Tanzania: 5
- Ghana, Kenya and Mozambique: 4
- Angola, Côte d'Ivoire, Zambia and Zimbabwe: 3 (Satterthwaite 2017)

But while the largest cities dominate the political and economic landscape, many experienced their most rapid growth between the 1950s and 1970s (Satterthwaite 2017). In many cases, small towns and cities account for a large and usually growing share of the urban population (ibid; Satterthwaite 2016a).

The demographic importance of smaller urban centres

Using available census data, Satterthwaite (2016a) estimated the share of the urban population that live in urban centres of different size categories in 33 sub-Saharan African countries. His estimates suggest that small and intermediate urban centres with less than 500,000 inhabitants account for between 20% and 40% of the urban population (Figure 2.5); however, the share of the population in this category is influenced by how urban centres are defined, discussed below. A more precise definition in terms of the lower threshold (when a rural settlement becomes urban) and upper threshold (when an urban settlement is too large to be defined as small) would likely reveal a much larger share of the population living in smaller urban centres (ibid).

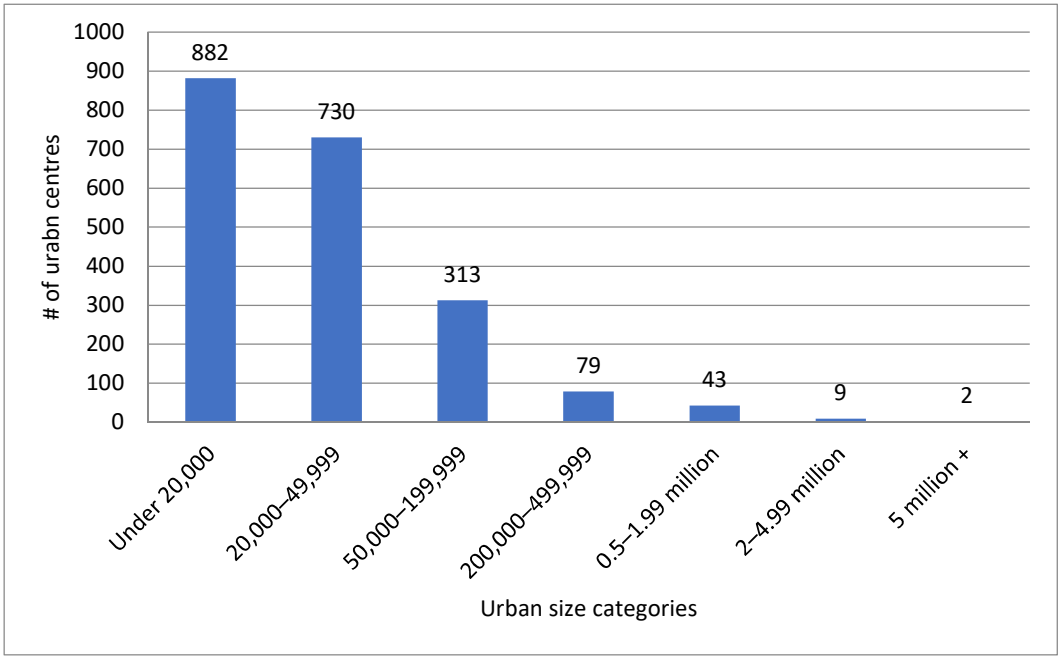
Figure 2.5: Share of total urban population in different size categories in select sub-Saharan African countries



Source: Data compiled by Satterthwaite (2016a) from UNDESA (2015)

Satterthwaite (2016a) also estimated the total number of urban centres by different size categories. Although the categories used for the estimates are different from those above, they show that urban centres with less than 50,000 inhabitants predominate the urban hierarchy (Figure 2.7). If reliable census data were available for the remaining 21 sub-Saharan African countries, Satterthwaite (ibid) suspects that this number would rise significantly, especially if data were available for Nigeria, Africa's most populous country. One study estimated that about 40 million people in Nigeria lived in 3,000 small towns of between 5,000 and 20,000 inhabitants in 2000 (Stoveland and Bassey 2000).

Figure 2.5: Total number of urban centres by size category in select sub-Saharan African countries



Data compiled by Satterthwaite (2016a) mainly from www.citypopulation.de/ and UNDESA

Satterthwaite's (2016a) estimates indicate that smaller urban centres in the region are both among the fastest and the slowest growing overall. In addition, their contribution to total urban growth may not be as significant as previously thought. In absolute terms, the annual growth in the population of the largest cities is usually greater than that of smaller urban centres due to differences in population size. For example, the population of Lagos grew at a rate of around 5% between 2000 and 2010, accounting for an additional 350,000 persons per year (Satterthwaite 2017). Smaller Nigerian urban centres growing at comparable or even faster rates are likely to have smaller annual population increments simply because their populations are not as large and thus not as significant for absolute growth. The relative contribution of urban centres of different sizes to overall urban growth thus depends more on the size of the annual population increment than on annual urban growth rates (ibid). The contribution of smaller urban centres to total urban population growth should not be overstated.

The findings nevertheless suggest that the share of the urban population living in smaller urban centres is underestimated. However, the wide variety of criteria used by individual countries to define urban centres, combined with the relative size of urban centres within and between different countries, makes their demographic importance difficult to document at the regional scale (Satterthwaite 2016a).

Defining smaller urban centres

It is difficult to make accurate international comparisons of the proportion of the urban population living in small and intermediate urban centres due to the lack of reliable census data in many sub-Saharan African countries, and the different criteria (population thresholds, population density, administrative status and/or concentration of non-agricultural employment) used to classify settlements as 'urban' (Satterthwaite and Tacoli 2003). In some countries, small towns are defined by a minimum population threshold, varying anywhere between 2,000 and 50,000 inhabitants, meaning that centres below such thresholds are classified as rural (Pedersen 1997). In other countries, small towns are defined by their position in the administrative hierarchy (district centres) rather than by their size, meaning that very small towns in sparsely populated regions are classified as urban, whereas much larger towns are classified as rural (Kamete 1998). For example, Touba, Senegal's second largest centre with 500,000 inhabitants, is classified as rural (Africapolis 2009).

The criteria used to distinguish small towns from intermediate centres vary as well (Satterthwaite and Tacoli 2003). Whereas some researchers use population ranges of less than 100,000 for small towns and 100,000 to 500,000 for intermediate centres, others use ranges of less than 20,000 for small towns and between 20,000 and 100,000 for intermediate urban centres (ibid). Because scale is relative, the appropriateness of these ranges will necessarily vary between countries; what may be considered a small town in one country may be considered an intermediate centre in another (Rondinelli and Ruddle 1978).

Nor can small and intermediate urban centres be distinguished based on their physical characteristics since villages, towns and cities often have similar population densities and physical patterns, and a mix of rural and urban activities (Rondinelli and Ruddle 1978; Satterthwaite and Tacoli 2003). For instance, urban households frequently engage in urban and rural farming, while rural households frequently engage in non-farm activities (Ellis 1998). Rural households often rely on remittances from family members working in urban areas, who may in turn rely on food transfers from family members in the village (Frayne 2005).

Given these complexities, Hardoy and Satterthwaite (1986) argue for a functional and relational approach to the definition of small and intermediate urban centres that reflects their national urban hierarchies and urban economic systems (see also Satterthwaite and Tacoli 2003). Emphasis is placed on the functions that smaller urban centres perform, including the infrastructure, services and facilities they provide, and to the linkages they have with their surrounding rural hinterlands and other urban centres. It is argued that a more sophisticated

classification system is required to reflect "the blurring of rural and urban areas, the diversity of settlements within urban and rural contexts, the increasing scale and complexity of urban systems, and the new forms of urbanization that are emerging" (Hugo and Champion 2004).

Such a classification system has yet to emerge, however, and remains the subject of ongoing debate. It is nevertheless widely agreed that small and intermediate urban centres ought to be seen along an overlapping rural-urban continuum rather than within a strict dichotomy (Figure 2.8) (Champion and Hugo 2004; Douglass 1998; Hugo et al. 2003; Satterthwaite 2006a; Satterthwaite and Tacoli 2003).

Figure 2.6: The rural-urban continuum

Rural	Ambiguous	Urban
Unambiguously rural settlements with most inhabitants deriving a living from farming and/or forestry or fishing	'Large villages', 'small towns' and 'small urban centres'. The proportion of the population in rural and urban areas	Unambiguously urban centres with much of the economically active population deriving their living from manufacturing or services
Populations of rural settlements range from farmsteads to a few hundred inhabitants	Populations range from a few hundred to 20,000 inhabitants	In virtually all nations, settlements with 20,000+ Inhabitants are considered urban
Increasing population size →		
Increasing importance of non-agricultural economic activities		

Source: Satterthwaite (2016a: 4)

Factors driving the growth of smaller African urban centres

While not all smaller African towns are growing, and some are stagnating, as observed in former mining towns (Pedersen 1997), many are growing (Satterthwaite 2016a). Several common factors driving the growth of African towns are identifiable in the literature. They include, but are not limited to the following:

- ***The decentralisation and upgrading of public sector administration and services*** has been a major driver of small town growth in the post-independence era (Pedersen 1997). In Zimbabwe, the government invested substantially in the development of 55 district service centres in the communal areas between 1980 and 1985, stimulating the growth of many (Wekwete 1990). In Ethiopia, administrative upgrading has attracted new administrative functions and personnel to the town of Kemise (Baker 2012).
- ***Transport and communication corridors*** have led to the growth of small towns in Western Africa (Africapolis, 2009). So too have rail corridors in Zambia (Nchito 2010).

Proposals to create agricultural corridors (see Paul and Steinbrecher 2013) may also stimulate the growth of small towns as marketing, processing and distribution centres for agricultural producers, but this remains to be seen.

- ***Mining operations*** contributed significantly to the growth and infrastructural development of small towns in the Central African Copperbelt, as observed in Zambia (Mususa 2012). However, the decline of mining operations due to fluctuating world market prices has contributed to the decline of many mining towns and motivated retrenched workers to migrate to rural areas or the capital city, Lusaka (ibid).
- ***Agricultural production*** has been a major driver of small town growth (Pedersen 1997; Satterthwaite and Tacoli 2003). In Zambia, sugar plantations and a refinery led to rising migration to the town of Mazabuka (Nchito 2010). Conversely, falling international prices for agricultural commodities have led to large population losses, as observed in Ghana's cocoa producing Central Region (Songsore 2000).
- ***Worsening economic conditions in large urban centres*** associated with falling incomes and employment have triggered return migration to some small towns and rural areas, as observed in Tanzania's Makete District (Mbonile 1995). Return migration tends to be lowest in remote rural villages with poor infrastructure and with few employment opportunities (Tacoli, 2002). In most cases, migration patterns tend to be circular (Potts, 2009).
- ***Growing non-farm economies*** in small towns are attracting migrants and seasonal labourers seeking alternative income-earning opportunities, as observed in Ethiopia (World Bank 2009). In Ghana, this trend has contributed to a process of 'rural urbanisation' driven by migration and livelihood transformations (Knudsen and Agergaard 2015).
- ***High rates of natural increase and high population densities in rural areas*** are propelling the growth of small villages into urban centres, as observed throughout West Africa (Africapolis 2009). This process, termed 'in-situ urbanisation', is likely to persist since Africa is the only continent that is expected to experience substantial growth in its rural population due to high rates of natural increase (UNDESA 2015). Re-classification is therefore likely to remain an important driver of urbanisation.

Other factors that could be contributing to the growth of African towns include land reform, decentralisation, and policies aimed at curtailing migration to the largest cities, but there is little evidence to substantiate their importance.

Due to a lack of comparable research, much less is known about the growth of intermediate African urban centres, which could be explained by their relative scarcity, as indicated in Figure 2.7. According to Rondinelli and Ruddle (1978), the lack of intermediate centres in the urban system has important implications for urban growth in that rural migrants have nowhere else to go besides primate cities. Rondinelli and Ruddle suggest that a more balanced urban system would allow migrants to move progressively from smaller to larger urban centres (a process termed 'step-wise' migration).

One study in Burkina Faso by Beauchemin and Schoumaker (2005) found that the development of both rural areas and smaller urban centres tends to encourage step-wise migration, though it also found that gradual improvements in local development (particularly in terms of economic opportunities) have made smaller urban centres more attractive to rural migrants. This evidence challenges the commonly held assumption among African officials that rural development will necessarily lead to reductions in migration to large cities by improving socio-economic conditions in sending areas (McGranahan et al. 2009). It is widely argued that a more appropriate strategy would be to promote the development of smaller urban centres not just as a means of retaining migrants, but also as a means of reducing inter-urban inequalities (Rondinelli and Ruddle 1978), including those linked to population health (Satterthwaite and Tacoli 2003).

2.1.3 Rural transformation

That smaller African towns (with less than 500,000 inhabitants) accommodate as much as 40% of the sub-continent's urban population and are expected to accommodate a large and typically growing share of future urban growth has contributed to a renewed interest in their current and potential role in rural and regional development (Owusu, 2005, 2008; Satterthwaite 2016a 2017; Satterthwaite and Tacoli 2003; World Bank and IMF 2013). Other contributing factors include the potential of small centres to generate non-farm employment opportunities for the rural poor, increasing their chance of escaping poverty; create positive spill-over effects on rural hinterlands through supporting agriculture, strengthening consumption linkages (household expenditure on goods and services and locally produced food), exerting upward pressure on rural wages, and generating rural non-farm employment; and contribute to a more balanced spatial pattern of the urban population, thereby avoiding urban primacy (Satterthwaite and Tacoli 2003).

However, interest in small towns has a long history that extends back to the late 1970s when scholars took issue with the traditional distinction between urban and rural development in light of evidence demonstrating the positive role played by small towns in agriculture and other rural-urban interactions, with specific reference to Africa (Rondinelli and Ruddle 1978; Hardoy and Satterthwaite 1986; Baker 1990; Baker and Pedersen 1992; Pedersen 1997). This scholarship emerged at a time when the impacts of global structuring were of growing concern in large metropolitan regions and when rural-urban differentials were appearing to diminish due to deteriorating urban conditions in the largest cities, as observed following the implementation of structural adjustment programmes in the 1980s and 1990s (Stren and White 1989; Jamal and Weeks 1993; Rakodi 1997), as discussed in Chapter Five (section 5.1.3). The interest in small towns emerged as a counterpoint to the prevailing focus on the urban crisis facing large African cities, with scholars urging "analysts and planners [to] conceive of small towns as part of wider national, regional and international systems" (Simon 1992: 31). The growing body of scholarship on small African towns that has subsequently emerged has demonstrated their varying roles in rural and regional development and the circumstances particular to each (Hardoy and Satterthwaite 1986; see also Satterthwaite and Tacoli 2003), as discussed below.

The interest in small African towns has not always been positive, however. Baker and Claeson (1997) identify three contrasting views in the evolving debate: the optimistic view; the pessimistic view; and the intermediate view. More recently, a transformative view has emerged that demonstrates the role of smaller urban centres in rural transformation (in terms of urbanising rural populations and diversifying livelihoods). This view echoes longstanding concerns (Satterthwaite and Tacoli 2003) that poor environmental conditions in smaller urban centres may undermine their growth and development potential at the expense of rural poverty reduction and regional development. To understand how environmental concerns have arisen in the evolving debate, the following sections outline each of these views.

The optimistic view

The optimistic view emerged from an influential book by Rondinelli and Ruddle published in 1978 entitled *Urbanization and Rural Development: A Spatial Policy for Equitable Growth* (Rondinelli and Ruddle 1978). The book was based on a recognition that efforts in the 1960s to promote modernisation and development through conventional growth pole and Western centre-periphery models (based on the early work of Christaller) failed to meet their objectives, which was reflected by the inability of the industrial sector to stimulate sufficient jobs for a growing working age population or to distribute benefits into rural areas (see Parr 1999).

According to Rondinellli and Ruddle (1978: 15), "[w]hat resulted were dual economies wherein small islands of modernisation emerged within seas of poverty".

One of the main concerns was that the rapid growth of large cities without commensurate employment growth was resulting in diseconomies of scale, reflected by the expansion of unplanned settlements—a process dubbed 'over-urbanisation' (see Firebaugh 1979). In response, policies sought to curtail rapid urban growth by placing restrictions on rural-urban migration. Rondinelli and Ruddle argued to the contrary:

> "The problem is not, as some theorists contend, that developing countries are overurbanized. Rather, it can be argued that developing countries are not urbanized enough, that problems arise not from the size of urban populations, or even the pace of city growth, but rather from the spatial pattern of development. The overconcentration of people and investments in a single primate city or a few metropolitan areas limits development potential and constrains the spread of benefits to rural areas. A pattern of spatial development is needed that deconcentrates urbanization and promotes a system of cities and towns, integrating rural and urban areas to achieve a more balanced and mutually reinforcing network of development centres" (ibid: 18-19).

Rondinelli and Ruddle (1978) called for investments in small towns as service centres for surrounding rural areas and as marketing and processing centres for rural agricultural production. Improving services in smaller centres was also promoted as a means of attracting rural-urban migrants, thereby alleviating population and infrastructural pressures on the largest cities. This so-called 'urban functions in rural development approach' strongly influenced international agencies, particularly USAID (Rondinelli 1986), and left an indelible mark on regional planning theory and practice due to its inherent common sense (Bromley 1984). Satterthwaite and Tacoli (2003) outline the different assumptions that have subsequently emerged in regional planning theory and practice:

- Smaller urban centres act as centres of demand/markets for agricultural produce from their surrounding rural region, either for local consumers or as links to national and export markets. Access to markets is a prerequisite to increasing rural agricultural incomes, and the proximity of local small and intermediate centres to production areas is assumed to be a key factor in their potential role.
- Smaller urban centres act as centres for the production and distribution of goods and services to their rural region. Such concentration is assumed to reduce costs and improve access to a variety of services, both public and private and for both rural

households and enterprises. Services include agricultural extension, health and education (and access to other government services) as well as banking, post and professional services such as law and accounting, and lower-order services, for example bars and cafés, and wholesale and retail sales of manufactured goods from within and outside the region.

- Smaller urban centres become centres for the growth and consolidation of non-farm activities and employment through the development of small and medium-size enterprises or through the relocation of branches of large private or parastatal enterprises.
- Smaller urban centres attract rural migrants from the surrounding region through demand for non-farm labour (and perhaps decreasing migration pressures on some larger urban centres) (Satterthwaite and Tacoli 2003: 13).

The pessimistic view

The pessimistic view was led by Southall (1979a, 1979b, 1988), who saw small towns as resulting from the dominance of urban areas over rural areas similar to how Lipton's dependency theory saw the dominance of developed countries over developing countries. For Southall (1988), the negative forces emanating from small towns arose from external sources, including colonial powers, local business elites, central governments, multinational corporations and international agencies.

Despite Rondinelli's influence, Southall motivated many policymakers in the 1970s and 1980s to focus on rural development, thereby avoiding small towns (Pedersen 1997). Southall has been heavily criticised for assuming that whether small towns are exploitative or supportive of rural development depends on the town itself, when it depends much more on the relationship between rural areas and the urban economy; if the national urban economy is supportive of rural development, then the development of small towns may also be supportive (Pedersen 1997). As Baker and Claeson (1997) conclude, "his [Southall's] view that small towns are merely part of a larger (viz. national and international) structure of rural exploitation whereby little can be achieved under prevailing conditions, is not only unhelpful but leads us into an intellectual *cul-de-sac"* (ibid: 18).

The intermediate view

The intermediate view emerged from an influential book by Hardoy and Satterthwaite published in 1986, which provided one of the first grounded analyses of small and intermediate urban

centres in Africa, Asia and Latin America (Hardoy and Satterthwaite 1986). Hardoy and Satterthwaite departed from other researchers, including Rondinelli and Southall, by rejecting universal generalisations and normative theoretical prescriptions in light of detailed case studies showing the uniqueness of smaller centres and the "phenomenally rich and diverse set of circumstances particular to each" (ibid: 399). A major conclusion was that small and intermediate urban centres require a high degree of decentralisation in development planning given the diversity of their local needs.

Hardoy and Satterthwaite (1986) challenged Rondinelli's rationale for creating an articulated hierarchy of small and intermediate urban centres in peripheral areas "where an articulated system will do nothing to address other factors underpinning poverty, including poor soil, inequitable land ownership structures, or lack of investment in flood control, irrigation and other essential infrastructure" (ibid: 404). Bromley (1984) concluded similarly that Rondinelli's approach "does not in itself present a solution to the gross inequalities in the distribution of income and wealth which characterise the 'underdevelopment' of most Third World countries" (ibid: 383).

Building on Hardoy and Satterthwaite (1986), Satterthwaite and Tacoli (2003) drew on case studies to analyse the factors influencing the potential of small and intermediate urban centres to contribute to rural and regional development. The case studies showed that not all centres fulfil these roles to the same degree, which depends in large part on the specific context in which they develop, on land-owning structures, on the availability of communications and transport connections, and on structural conditions at the local, national and international scales. They also showed that not all small and intermediate urban centres necessarily contribute to poverty and inequality reduction (ibid).

The transformative view

The transformative view has recently emerged from a small, but growing body of literature (Christiaensen et al. 2013; Christiaensen and Todo 2013; Proctor 2014; Tacoli 2017) emphasising the positive contributions that small urban centres can make to rural transformation. This view is distinguished from the optimistic view insofar as its claims are grounded somewhat more firmly in empirical evidence rather than theoretical argumentation. The transformative view is supported by three recent studies and by broader trends in urban and rural development.

The first study, by Christiaensen and Todo (2013), analysed cross-panel data from 51 countries across five continents, finding that small towns and rural off-farm activities (termed the 'missing

middle') yielded more inclusive growth and faster poverty reduction than agglomeration in the largest cities. No statistical relationship was found between poverty reduction and agglomeration. The second study, by Christiaensen et al. (2013), tracked a representative sample of 3,301 rural individuals in the Kagera region of Tanzania from the early 1990s to 2010. Similar to Christiaensen and Todo (2013), the study found that poverty declined from 53% to 30% and that nearly half of the people who escaped poverty did so by shifting to rural non-farm activities and/or migrating to small towns. Only 17% escaped poverty by migrating to Dar es Salaam, Mwanza and Kampala (ibid).

While both studies found a relationship between poverty reduction and the 'missing middle', they did not identify the explanatory factors. Christianensen and Todo (2013) provide two theoretical explanations: (a) the proximity of secondary towns to rural areas and their higher-demand for low-skilled labour as opposed to more distant cities increases the likelihood that rural migrants may find a job and thus escape poverty; and (b) the probability of being gainfully employed is higher in secondary towns than in the largest cities where high wages may be offset by high living costs, thereby decreasing income and the incentive to migrate (reflecting the Harris-Todaro model) (ibid), as discussed above. Based on the findings, Christianensen and Todo conclude "that when rapid poverty reduction is the primary objective, more attention should be given to fostering rural diversification and secondary town development" (ibid: 52).

A third study, by Potts (2018), analysed agricultural employment data given the known links between towns and labour specialisation in (urban) non-agricultural activities (e.g. industry, trade, construction) in order to assess mismatches in countries where the degree of labour in such activities is lower than orthodox theories about urbanisation presuppose. The study found that in situ urbanisation has contributed significantly to urbanisation in Côte d'Ivoire, Ghana and Mali. This observation is particularly evident in Côte d'Ivoire, where nearly all urbanisation reported in the 2014 census was contributed to by settlements at the bottom of the urban hierarchy. More than half of households in these settlements were engaged in non-agricultural activities, thus supporting the claims above that the growth of smaller urban centres is contributing to rural transformation.

The transformative view of smaller urban centres is also supported by broader trends in rural and urban development. Despite urbanisation, rural-urban linkages referring to the flow of people, financial resources (remittances), ecosystem services, and goods (food) and services between town and country have become more rather than less intense (Tacoli 1998, 2003, 2006; Allen et al. 2014). In this context, smaller urban centres have become increasingly important connecting points for rural-urban linkages through serving as mobility nodes for seasonal

migrants; processing, marketing and distribution centres for rural agricultural products; and service centres (education, health care) for surrounding rural hinterlands (Satterthwaite and Tacoli 2003). As Tacoli and Vorley (2015) argue; "The idea that 'urban' considerations are only applicable to cities is another false assumption. It ignores the crucial role that smaller urban centres—emerging urban spaces in rural areas—can play in the 'virtuous cycle' of rural-urban development…" (ibid: 3).

Proponents of the transformative view echo longstanding concerns (Satterthwaite and Tacoli 2003; Proctor 2014; Satterthwaite 2017) that environmental health risks linked to infrastructure and service deficits in smaller urban centres may undermine their growth and development potential in terms of their ability to safeguard health, maintain labour productivity, retain working age populations, attract rural migrants and skilled labour, and compete with larger urban centres for investment (for a detailed review, see Annex II). Ensuring that the growth of smaller urban centres does not result in urban risk accumulation cycles will therefore depend increasingly on the ability of urban planning to support risk-sensitive urban development pathways, as discussed below.

2.1.4 Urban risk

Poorly planned and managed urbanisation, disasters and climate change, and ecosystems degradation are combining in environmentally hazardous ways and affecting the health of African urban populations (Bull-Kamanga et al. 2003; Parnell et al. 2007; Douglas et al. 2008; Pelling and Wisner 2009; Simon 2010; Kovats et al. 2014; Parnell and Walawege 2014; Adelekan et al. 2015; Dodman et al. 2017; Fraser et al. 2017; Oni et al. 2017). Most research on the subject comes from a small, but growing number of case studies of predominately large cities (Simon 2010; Adelekan et al. 2015). While there is developing evidence of urban growth increasing urban risk in Africa, the literature remains relatively limited (Fraser et al. 2017).

This section reviews what is known about the experience of urban risk in sub-Saharan Africa based on a recognition that its late urban transition is transforming urban risk profiles (Pelling and Wisner 2009; Smit et al. 2011; Smit and Parnell 2012; Fraser et al. 2017). Three strands in the literature are of interest here. The first strand emphasises the need to understand and address urban risk across a spectrum given the wide range of hazards that threaten the lives, livelihoods and assets of African urban dwellers (Adelekan et al. 2015; Bull-Kamanga et al. 2003; Pelling and Wisner 2009; Satterthwaite et al. 2018b), as discussed in Chapter One (section 1.1.1). While available evidence indicates that everyday hazards (such as infectious and parasitic

diseases and road traffic accidents) account for most ill-health, death and disability in African urban centres (Pelling and Wisner 2009), the majority of research on urban risk has focused on intensive flood events, particularly in large coastal cities (Table 2.2).

Table 2.2: Some recent studies on urban flood risk in sub-Saharan Africa

City	Region	Location (coastal/inland)	Population size (2015 est)*	References
Cape Town (South Africa)	Southern Africa	Coastal	3,660,000	(Mukheibir and Ziervogel 2007)
Lagos (Nigeria	Western Africa	Coastal	13,123,000	(Douglas et al. 2008; I. Adelekan 2010; Hanson et al. 2011)
Ibadan (Nigeria)	Western Africa	Inland	3,160,000	(Agbola et al. 2012)
Abeokuta (Nigeria)	Western Africa	Inland	495,000	(Adelekan 2011)
Maputo (Mozambique)	Eastern Africa	Coastal	1,187,000	(Douglas et al. 2008)
Mombasa (Kenya)	Eastern Africa	Coastal	1,104,000	(Awuor et al. 2008; Kithiia and Dowling 2010; Kithiia and Lyth 2011)
Saint Louis (Senegal)	Western Africa	Coastal	270,000	(Diagne 2007)
Dakar (Senegal)	Western Africa	Coastal	3,520,000	(Simon 2010)
Accra (Ghana)	Western Africa	Coastal	2,277,000	(Douglas et al. 2008; Pelling and Wisner 2009)
Cotonou (Benin)	Western Africa	Coastal	682,000	(Dossou and Gléhouenou-Dossou 2007)
Dar es Salaam (Tanzania)	Eastern Africa	Coastal	5,116,000	(Kithiia 2011)

Census data from UNDESA (2015)

Scholars (in particular, Bull-Kamanga et al. 2003; see also Dodman et al. 2013) within and beyond Urban ARK question whether the prevailing focus on urban floods and other large-scale events is reinforcing a perception that they are the most significant for human loss when other hazards (particularly everyday events) may be more so. Other studies document various hazards in African urban centres, including, for example: infectious and parasitic diseases that disproportionately affect the urban poor (Kyobutungi et al. 2008); poor sanitary conditions that create the conditions for cholera outbreaks during seasonal and episodic flood events (Lwasa 2010; Songsore 2017); shack fires in overcrowded informal settlements that lack fire breaks,

safe electricity connections and access routes for emergency services (Pharoah 2009); water scarcity linked to population growth, unsanitary conditions, water pollution, inadequate drainage and wastewater management, and climate change (Jacobsen et al. 2012); increasing risks of strong winds related to changing patterns of urban form and climate (Adelekan 2012); and climate-related heat stress in cities where current temperatures are high, where the urban heat island is in effect, where a large share of the urban population live in overcrowded and poorly ventilated housing, and where where current climate-sensitive diseases are prevalent (Kovats et al. 2014).

While the relative importance of urban risk across the spectrum remains poorly understood in the absence of sufficient information (Osuteye et al. 2017; Satterthwaite et al. 2018), as discussed below, it is widely recognised that hazards of different degree and frequency have highly localised impacts that depend on a wide range of risk factors, including, for example, social identity and status; pre-existing health conditions; geography and climate; access to quality housing and basic services; security of tenure; and the existence of strong and accountable local governments with effective urban planning authorities (Wisner et al. 2003; Satterthwaite et al. 2007; Dodman and Satterthwaite 2009; McGranahan et al. 2009; UNISDR 2009; IFRC 2010; Simon 2010; Smit and Parnell 2012; Abass et al. 2013; Mitlin and Satterthwaite 2013; Adelekan et al. 2015; Dodman et al. 2017; Levy 2018). The highly local nature of urban risk negates generalisations within and between African countries and requires detailed case studies—of the kind undertaken here—to fully comprehend.

The second strand emphasises the links between urban risk, climate change and the urban poor. African urban centres are located in a region that is among the most exposed to the impacts of climate change (Revi et al. 2014). These impacts are expected to intensify existing risks and create new ones in urban centres located in hazard-prone areas (such as low-elevation coastal zones, river valleys, arid regions, steep terrains) without the capacity to plan urban growth, provide basic services and adapt to environmental hazards (Parnell et al. 2007; Simon 2010; Parnell and Walawege 2014). For example, a study by Kiunsi (2013) assessed the constraints on climate change adaptation in Dar es Salaam (Tanzania) associated with the widespread lack of water, drains, sewers and solid waste collection in informal settlements, which accommodate around 70% of the city's population. Another study of the potentials for climate change adaptation in East African cities identified the rapid expansion of ill-served informal settlements as one of the most pressing challenges facing initiatives seeking to link urban development with risk reduction (Kithiia 2011). Available studies demonstrate the links between urban poverty and

risk and the need for risk-sensitive and pro-poor urban development pathways (Fraser et al. 2017).

The third strand emphasises the nature and scale of urban risk in different geographic locations and in urban centres of different sizes. As discussed above, most studies of urban risk in Africa have focused on coastal cities. For example, Adelekan (2010) assessed increases in flooding in the coastal city of Lagos (Nigeria) and attributed the city's increasing exposure and vulnerability to uncontrolled spatial expansion, the concentration of informal settlements in low-lying areas, inadequate storm water drainage, and sea level rise. Another study of flooding and sea level rise in Dakar (Senegal) identified multiple risk factors, including the city's location on a peninsula extending into the Atlantic Ocean, variations in elevation, a number of people living in informal settlements located in low-lying areas, rapid growth and the absence of an overarching planning agency for the metropolitan region (Simon 2010). These studies highlight the large number of people who are at risk from climate change in coastal cities, which were estimated to account for 12% of Africa' urban population in 2000 (McGranahan et al. 2009). Many are also growing rapidly (ibid).

There is increasing interest in inland cities, which face different risks from coastal cities, such as desiccation and desertification, heat islands, water insecurity, and fluvial flooding (Simon 2010). Among the inland cities facing the most serious water insecurity risks are Bulawayo (Zimbabwe), Dodoma (Tanzania), Kano (Nigeria) and Naivasha (Kenya) (ibid), although coastal cities, such as Cape Town (South Africa), face similar risks as well (Ziervogel et al. 2010; Mahr 2018). Less attention has been paid to inland cities, with some exceptions, notably Kampala (Uganda) (Lwasa 2010). This gap is particularly evident in Central Africa where around 70% of the urban population live in informal settlements (UN-Habitat 2007). Cities in the region, such as Abuja (Nigeria), Bamako (Mali), Kinshasa (Luanda) and Ouagadougou (Burkina Faso), have populations that are expected to double by around 2030 (ibid), highlighting the need for research to inform future urban policy and practice.

Similarly, little attention has been paid to small and intermediate urban centres in academic and policy circles, even though they account for a large and typically growing share of sub-Saharan Africa's urban population, as discussed above. There is thus a clear need to better understand how the nature and scale of urban risk varies in different geographic locations and in urban centres of different sizes, how processes of urban change are transforming urban risk profiles across the region, and what the implications are for the governance of urbanisation and risk.

The absence of detailed demographic and health data

Demographic and health data provide information on the relationship between population structure and the burden of disease, death and disability (McGranahan et al. 1999). They also provide insight into the relative importance of environmental factors in determining current and future population health status (ibid). However, if demographic and health data are lacking for the largest cities, they are especially lacking for smaller urban centres (Satterthwaite and Tacoli 2003). Data gaps transcend the risk spectrum (particularly for everyday and small events) and stem from the lack of: spatial coverage in the DHS; cause-specific mortality data; data on everyday hazards; and databases disaggregated at the urban scale.

Lack of spatial coverage in the DHS

The DHS is the primary source of information on population health in low- and middle-income countries. However as a national sample survey, it does not provide sufficient spatial information to identify urban centres by their size, making the urban size dimension of urban health difficult to document (Hewett and Montgomery 2001; Montgomery et al. 2004; Montgomery 2009; Satterthwaite 2017). In addition, most indicators presented in country-level DHS reports are aggregated into homogenous 'urban' and 'rural' categories, obscuring differences in health outcomes and their determinants between urban centres of different sizes and locations.

Lack of cause-specific mortality data

Cause-specific mortality data are lacking in most sub-Saharan African countries, which seldom have up to date vital registration systems for live births and deaths (Mathers et al. 2005; Mberu et al. 2015). Without this data, most analyses of urban health have been largely presumptive in terms of linking mortality to particular causes, for example, in the literature on 'slum health' (see Unger and Riley, 2007). While there is good evidence to attribute a large share of mortality in 'slums' to biological pathogens linked to poor environmental conditions (see Lilford et al. 2017), as the evidence reviewed below shows, causal links are too often drawn without accurate data.

Lack of data on everyday hazards

Case studies compiled by Pelling and Wisner (2009) indicate that everyday hazards (infectious and parasitic disease, road traffic accidents, and other chronic hazards) and small disasters (localised landslides, seasonal floods) cause more damage to people's lives, livelihoods and

assets than large disasters in African urban centres. Yet, the impacts of everyday hazards and small disasters may be under-estimated since they fail to meet the criteria to be recorded as 'disasters' in the major national and international databases, such as EM-DAT (the Emergency Events Database[3]) (Osuteye et al. 2017).

A study by Osuteye et al. (2017) on the availability of data on disaster loss and damage found that sub-national databases, such as DesInventar[4], created specifically to capture smaller events have yet to collect data that are sufficiently disaggregated to capture urban events since their classification systems do not sufficiently distinguish between urban and rural areas. Only events occurring in districts that are known to contain cities (for example, Nairobi District) are discernible. Nor does DesInventar sufficiently capture everyday hazards since its database mainly captures small disasters, such as seasonal floods and localised landslides and fires, thereby neglecting the impacts of endemic diseases (malaria, diarrhoea, tuberculosis) and accidental injuries, including road traffic accidents (ibid).

Lack of databases disaggregated at the urban scale

Various databases are available for different types of hazards (everyday, small and large) at different scales (local, sub-national, national and international) (Table 2.3). However, many contain large gaps at the sub-national scale and for smaller events (including disease and injury). Moreover, since databases typically use different indicators and scales, their data cannot be aggregated or compared to document urban risks or their socio-spatial distribution (Osuteye et al. 2017).

[3] To be included in the EM-DAT database, an event must meet one of the following three criteria: 10 or more people reported killed, 100 people reported affected, a request for international assistance, and/or a declared state of emergency (Satterthwaite et al., 2007).

[4] DesInventar was created in Latin America to capture recurrent, small-scale and relatively low-severity events that do not meet the criteria to be included in international disaster databases, such as EM-DAT (Satterthwaite et al. 2007). DesInventar uses newspapers, police and public health reports as sources of information, and has expanded to include 15 sub-Saharan African countries, including Comoros, Djibouti, Ethiopia, Kenya, Madagascar, Mali, Mozambique, Morocco, Mauritius, Niger, Togo, Tunisia, Senegal, Sierra Leone, Seychelles, Uganda, and Tanzania (Zanzibar only).

Table 2.3: Major scales of health and disaster databases and their relevance to urban areas

Scale	Everyday hazards	Small disasters	Large disasters
International and regional	The World Health Organization (WHO) Global Burden of Disease indexes, including road traffic accidents by region and country	--	EM-DAT NatCat Global Disaster Identifier Number (GLIDE) Disaster Database Project Asian Disaster Reduction Centre (ADRC)
National	The DHS has data for rural and urban areas but not for specific cities let alone informal settlements	DesInventar – African coverage: Comoros, Djibouti, Ethiopia, Kenya, Madagascar, Mali, Mozambique, Morocco, Mauritius, Niger, Togo, Tunisia, Senegal, Sierra Leone, Seychelles, Uganda, and Tanzania (Zanzibar)	National databases (Australia, Canada, Nepal, Orissa, Philippines, St. Lucia, Sri Lanka)
Sub-National (urban and rural)	Demographic and Health Surveillance Systems (DHSS)	DesInventar, but urban districts not always differentiated from rural districts	--
Individual	Hospital episode data (mostly relevant to everyday hazards, but potentially useful for uncovering the health impacts of larger events) Health passports for some countries (Malawi)		
Event specific	Police records	DesInventar records loss and damage from multiple hazards that can be disaggregated	Various

Developed by author, presented in Osuteye et al., (2017)

Health conditions attributable to local environmental hazards

African populations face an especially large and multifarious burden of disease, one-third of which is estimated to be attributable to local environmental hazards (Prüss-Üstün and Corvalán 2006). These hazards transcend the risk spectrum and include:

- ***Biological pathogens*** in the air, water and soil;
- ***Chemical pollutants***, such as lead (in water, food, air and paint), asbestos (in building insulation), indoor air pollutants from fuel combustion (including cooking fuels), toxic

waste from industrial sites, outdoor air pollutants from industry and motor vehicles, and occupational exposures;

- ***Access to natural resources***, such as food, fresh water, fuel, forests, and land; natural resource degradation (particularly that caused by poorly planned and managed urban growth and expansion);
- ***Physical hazards***, such as flood, drought, land-slides, earthquakes, road traffic accidents, and shack fires;
- ***Climate change***, such as temperature increase, drying, the increased frequency and intensity of extreme weather events, and sea level rise; and
- ***Deficiencies in the built environment***, such as houses and other buildings, water supplies, sanitation facilities, refuse storage, and hazardous locations (For a detailed review, see Annex III) (Hardoy et al. 2001; Kjellstrom et al. 2007; Kovats and Akhtar 2008; Mitlin and Satterthwaite 2013; Satterthwaite 1993).

This section examines diseases and health conditions with causes that are known to be associated with these hazards (termed 'environmental health problems'). Such problems are categorised by disease group in Table 2.4 based on a comprehensive report by the World Health Organization (WHO) (Prüss-Üstün and Corvalán 2006).

Table 2.4: Health conditions and diseases with known environmental contributions

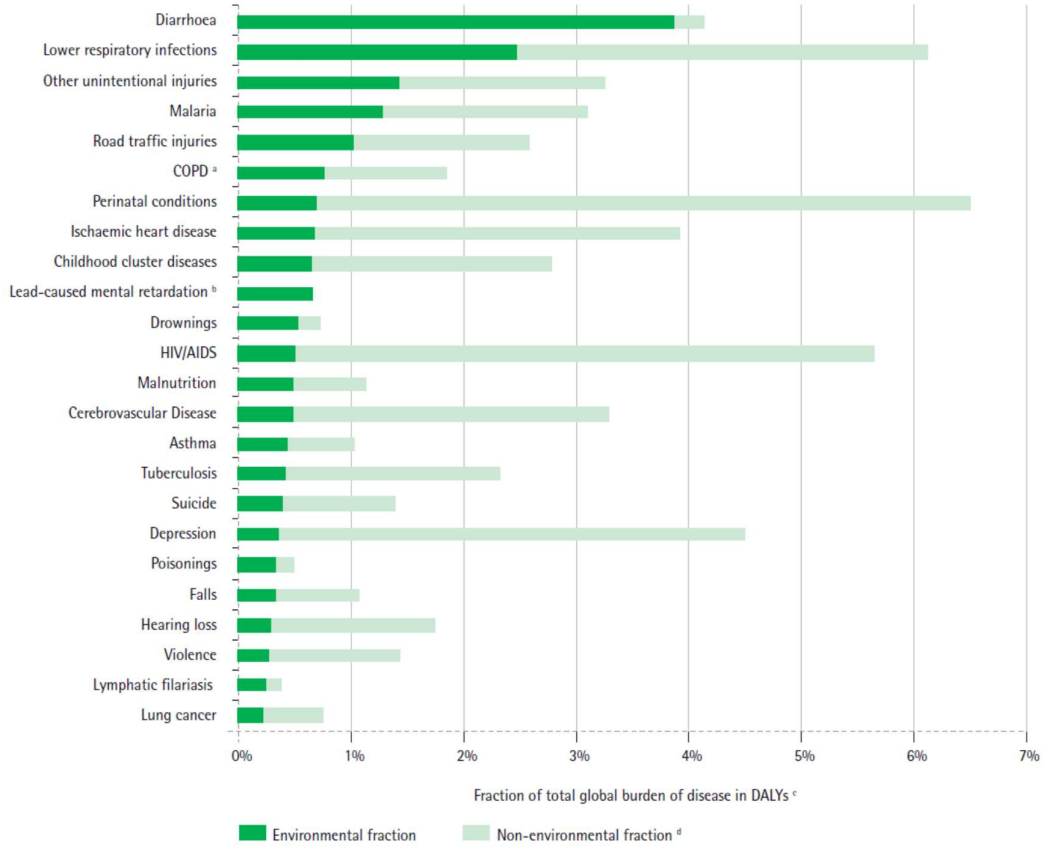
Group 1			**Group 2**	**Group 3**
Infectious diseases	**Parasitic diseases**	**Nutritional disorders**	**NCDs**	**Unintentional accidents/ incidents**
Respiratory diseases Diarrhoeal diseases Intestinal nematode infections Trachoma	Malaria Dengue Onchocerciasis Lymphatic filariasis Schistosomiasis Leishmaniosis	Malnutrition Anaemia	Cancers (lung) Neuropsychiatric disorders Cataracts Deafness Cardiovascular diseases Chronic Obstructive Pulmonary Disease (COPD) Asthma	Road traffic accidents Poisonings Falls Burns Drownings Animal bites

Informed by Prüss-Üstün and Corvalan (2006)

The report drew on existing evidence and expert opinion and identified 85 categories of disease and injury with known environmental causes/contributions (Prüss-Üstün and Corválan 2006). Figure 2.9 ranks the diseases and health conditions with the largest environmental

contributions, led by diarrhoea, lower respiratory infections, other unintentional injuries (linked to workplace hazards, radiation and industrial accidents), malaria, and road traffic accidents.

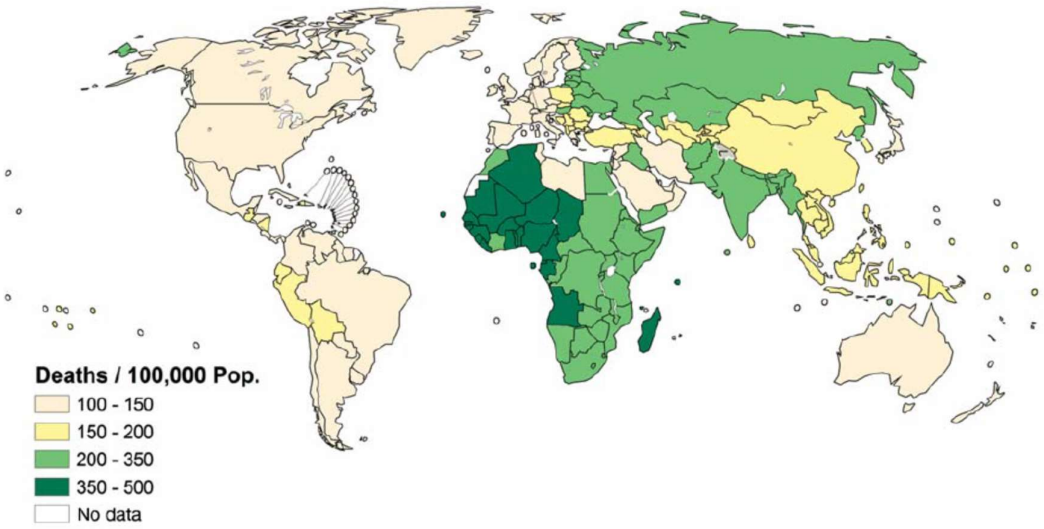
Figure 2.7: Diseases with the largest environmental contributions



Source: Prüss-Üstün and Corvalán (2006: 11)

The report also found that environmental health problems were unequally distributed within and between regions, with sub-Saharan Africa (particularly West Africa) having the world's largest environmental health burden (measured in deaths per 100,000 people) (Figure 2.10).

Figure 2.8: Distribution of environmental disease prevalence by WHO sub-region, 2002



Source: Prüss-Üstün and Corvalán (2006: 10)

Epidemiological studies on the actual burden of health conditions ranked in Figure 2.9 are limited in Africa, especially for urban populations. However, data from the Global Burden of Disease Study and other high level evidence reviews provide an indication of the significance of this burden. For diarrhoea, sub-Saharan Africa had the highest under-five mortality rate at 192 per 1,000 in 2015, followed by South Asia at 86 (Troeger et al. 2017a). Malawi's rate of 183 was slightly below that of sub-Saharan Africa's (ibid). For lower respiratory infections, sub-Saharan Africa had the highest under-five mortality rate of 251 per 1,000 in 2015, followed by South Asia at 123 (Troeger et al. 2017b). Malawi's rate of 275 was higher than that of sub-Saharan Africa's. For malaria, sub-Saharan Africa had the greatest numbers of death at all ages at 705,172 in 2013, followed by South Asia at 121,777 (Murray et al. 2014). Malawi accounted for 4,603 deaths in the region (ibid). For road traffic accidents, the most recent data from the WHO on road safety indicates that Africa as a whole had the highest rate of fatalities from road traffic accidents at 26.6 per 1,000 in 2013, more than double the average rate of high-income countries (WHO 2015).

A key obstacle to identifying causes of death in sub-populations is the lack of cause-specific mortality data in sub-Saharan African countries, many of which do not have up to date vital registration systems for live births and deaths (Mathers et al., 2005; Mberu et al., 2015). Death registration data for Malawi, for example, are not yet in WHO estimates. Without accurate data, many analyses of urban health have been largely presumptive in terms of linking mortality to particular causes; for example, in the literature on 'slum health' (see Unger and Riley 2007) .

While there is good evidence to attribute a large share of mortality in 'slums' to environmental hazards (see Lilford et al. 2017), causal links are too often drawn without detailed or reliable data. This is why this study focuses on disease and health conditions with known environmental contributions. What is known about urban health in sub-Saharan Africa, and the global South more broadly, is reviewed in the following section on urban planning.

Vulnerable urban populations

The environmental health problems identified above are unequally distributed within and between urban populations depending on social identities and positionalities, income and poverty levels, hazard exposures, access to basic services, and capacities to plan and manage urban growth and adapt to emerging environmental hazards (Hardoy et al., 2001; Kjellstrom et al., 2007). Environmental health risks are thus socially constructed, as discussed in Chapter One (section 1.1.2). Groups commonly labelled 'vulnerable' include the following.

The urban poor

Because the urban poor typically live in 'informal' settlements or 'slums' characterised by poor quality living environments, their health tends to suffer disproportionately from local environmental hazards (Harpham et al. 1988; Bradley et al. 1992; World Bank 1993; Stephens et al. 1996; Hardoy et al. 2001; Vlahov et al. 2007; Kjellstrom and Mercado 2008; Lilford et al. 2017). Several factors identified by Hardoy et al. (2001) and others (Lilford et al. 2017) heighten their vulnerability:

- Many live in poor quality, overcrowded and poorly ventilated housing without adequate provision of basic services (water, sanitation, drainage, sewerage, and liquid and solid waste collection).
- Many practice unhygienic water handling (communal dip cups) and storage (uncovered water containers in the home), resulting in downstream water contamination, particularly where water and sanitation is poor.
- Many lack access to adequate health care, emergency services and effective immunisation programmes.
- Many live on land exposed to physical hazards, chemical pollutants in the soil and water, outdoor air pollution from nearby industries, and the impacts of climate change.
- Many tend to walk and cycle and are thus more likely to be at risk of road traffic accidents.

In localities where these conditions are prevalent, the urban poor often suffer from a 'double burden' of communicable disease (malaria, diarrhoea, meningitis) and non-communicable disease (lung cancer, chronic obstructive pulmonary disease (COPD)) linked to environmental factors (Sverdlik 2011). In such contexts, the urban poor often suffer from what is termed a 'poverty penalty' linked to poor quality living environments (Galea et al. 2005; Vlahov et al. 2005; Tacoli, 2017). However, the urban poor are not a homogenous group, and include people whose health is especially vulnerable to certain environmental hazards (Hardoy et al. 2001). The question is thus *who* is vulnerable to *what*, *why* and *where.*

Infants and children

Infants and children are identified as among the most vulnerable to infectious and parasitic diseases (such as diarrhoea and pneumonia), accidental injuries (burns, scalds, cuts), physical hazards and malnutrition (Satterthwaite et al. 1996). The malnourished in poor quality environments can be especially vulnerable, creating the conditions for lifelong disadvantages arising from physical and cognitive development issues (ibid; Harpham and Molyneux 2001; Bartlett 2008; Hardoy et al. 2001; Tacoli 2017). Research by the African Population and Health Research Council (APHRC) analysing demographic and health surveillance data in Kenya (Kyobutungi et al. 2008) show that under-five mortality rates are highest among infants in Nairobi's 'slums' (Table 2.5), suggesting that urban poor children tend to suffer disproportionately from ill-health.

Table 2.5: Comparison of child mortality rates in Kenya, 2000-2003 and 2012-13

KENYA CHILD MORTALITY: 2000-2003						
	NCSS 2000	**Demographic and Health Survey 2003**				
	Nairobi Slums	**All Rural**	**Rural Poor**	**All Urban**	**Nairobi**	**National**
Neonatal mortality rate	30.4	34	35.5	26	32	33
Post-neonatal mortality rate	60.9	44	58.4	36	35	44
Infant mortality rate	91	79	94	61	67	77
Child mortality rate	65.2	41	55.4	35	30	41
Under-five mortality rate	151	117	144.2	93	95	115
KENYA CHILD MORTALITY: 2012-2013						
	NCSS 2012	**Demographic and Health Survey 2014**				
	Nairobi Slums	**All Rural**	**Rural Poor**	**All Urban**	**Nairobi**	**National**
Neonatal mortality rate	14.4	21	20.5	26	39	22
Post-neonatal mortality rate	24.9	18	17.7	16	16	16
Infant mortality rate	39.2	40	38.2	43	55	39
Child mortality rate	40.6	16	15.7	15	17	14
Under-five mortality rate	79.8	56	53.3	57	22	52

Data from the Nairobi Urban Health and Demographic Surveillance System (NUHDSS) (Kyobutungi et al. 2008)

High levels of morbidity and mortality among infants and children in 'slums' have been attributed to their relatively weak immune systems, risky behavioural tendencies, low levels of immunisation, and high levels of malnutrition amidst limited access to basic services (particularly water and sanitation) and curative health care (Satterthwaite et al., 1996; Bartlett, 2008).

Women and young girls

Women and young girls face heightened vulnerability to various health problems (environmental and non-environmental). Several common examples in the literature stand out:

- The gendered division of household labour means that women and young girls responsible for cooking are often disproportionately exposed to indoor air pollution, particularly in households that use dirty cooking fuels in cramped and poorly ventilated housing; those responsible for collecting water are often exposed to gender-based violence, particularly in neighbourhoods where lighting is poor and footpaths are isolated; those responsible for caring for the sick and injured often face heightened time

restrictions, contributing to women's 'time poverty' and further limiting the time necessary to sustain household health (Satterthwaite et al. 1996; Hardoy et al. 2001; Sverdlik 2011; Tacoli 2012).

- Young girls are often fed last or less in low-income households that privilege the nutrition of boys, heightening the vulnerability of girls to infectious and parasitic diseases. Their vulnerability can be intensified during disaster events that disrupt household income (Brown and Dodman 2014).
- The mortality burden among women and children (including young girls) is often higher during extreme weather events (such as floods, high winds and landslides) "given their lesser size and strength and capacity to move rapidly" (Bartlett 2008: 15).
- The frequent omission of women from formal decision-making processes and planning procedures often means that their environmental health needs and priorities remain neglected (Hardoy et al. 2001; Chant 2013).

The elderly

Elderly people have been identified as being vulnerable to non-communicable diseases and injuries associated with ageing, physical inactivity, unhealthy lifestyles and pre-existing health conditions, and to injuries associated with occupational hazards (Sverdlik 2011). Many face heightened vulnerability to the health impacts of heat stress given their susceptibility to heat stroke and tendency to live alone (Stone 2012). These factors render the elderly especially vulnerable to the health impacts of climate-related heat stress, particularly where the urban heat island is in effect (ibid; Revi and Satterthwaite 2014).

Rural-urban migrants

Health studies on rural-urban migrants in sub-Saharan Africa are relatively few and tend to focus on the largest cities. One study on the links between urbanisation, migration, poverty and health in Nairobi's 'slums' (Zulu et al. 2011) found that much of the population in unplanned settlements are migrants, many of whom face various health risks linked to local environmental hazards.

Desk-based reviews (Peer 2015) have found some evidence indicating that rural-urban migrants are vulnerable to infectious diseases (particularly HIV/AIDS and tuberculosis) and non-communicable diseases (particularly cardiovascular disease) because many tend to engage in risky sexual behaviours and live in poor environments, such as 'slums'. Whether migrants may be more vulnerable than other 'slum' dwellers remains unclear in the absence of sufficient

evidence, and is likely to depend on their exposure to occupational hazards, income, sexual behaviour, and duration of stay in 'slums' (Tacoli et al. 2015).

The problem with categories

While certain groups have been observed to be more vulnerable than others, the practice of labelling particular people as vulnerable is neither entirely accurate nor appropriate. Not all social groups are equally vulnerable to hazards when exposed (e.g. people with pre-existing health conditions, such as malnutrition, may be more susceptible to infectious disease) (Hardoy et al. 2001). On the other hand, vulnerable groups may not necessarily be more susceptible when exposed to hazards (women responsible for cooking are not inherently more susceptible to indoor air pollution linked to the use of biofuels than men, but are rather more exposed) (Satterthwaite et. al. 2018). Researchers, therefore, ague for an understanding of an individual's situation and underlying vulnerabilities rather than their category (ibid).

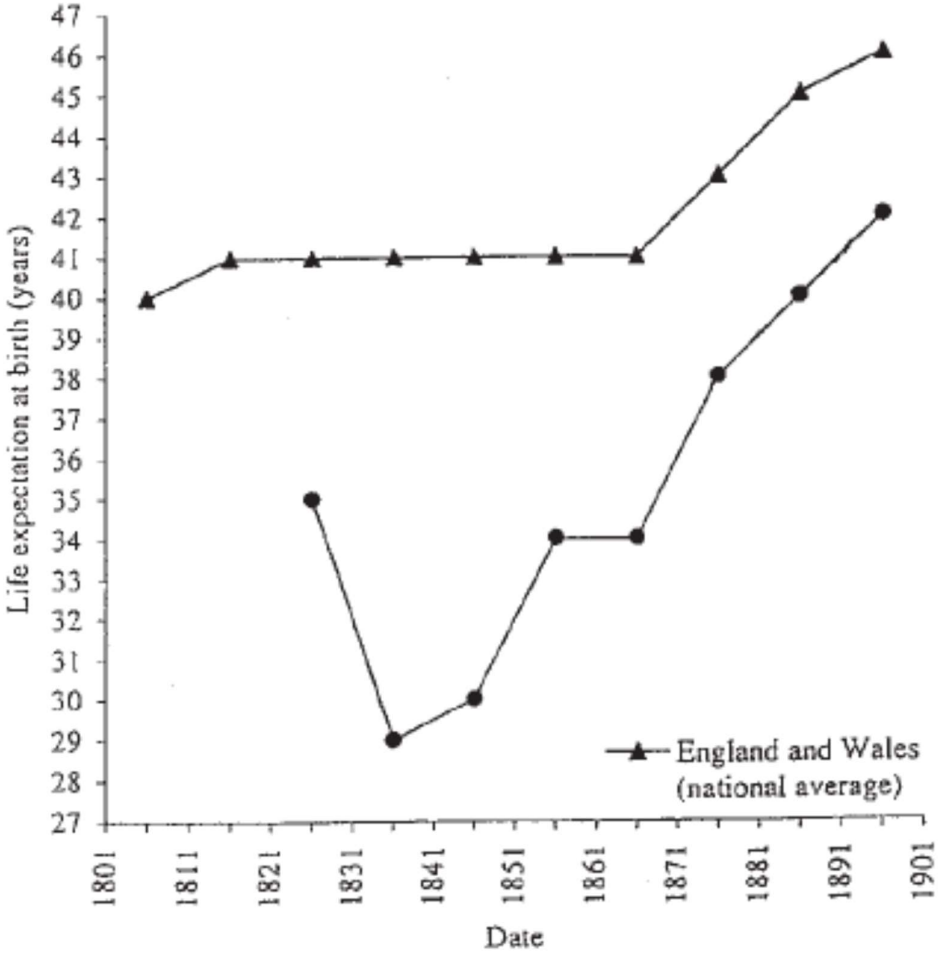
2.1.5 Urban planning

The evidence above indicates that urban health inequalities have become increasingly linked to the urban environment and therefore to the traditional field of urban planning. Commentators (Northridge et al. 2003; Northridge and Sclar 2003; Corburn 2009; Barton and Grant 2013) are thus calling for planning as a profession that emerged in the late nineteenth century to improve sanitary conditions to return to its origins in public health. However, most research on urban health has focused overwhelmingly on Europe and North America (for example, Corburn 2009; Frumkin 2002; Jackson 2003; Northridge et al. 2003) at the expense of the global South. In an effort to expand the geography of the debate, this section traces the origins of urban planning and public health during the colonial and post-colonial periods based on the sub-Saharan African experience, and explores the need for new frameworks that are grounded in contemporary Southern urban realities.

The urban sanitary reform era

Rapid and unrestrained industrialisation in the nineteenth century led to a significant rise in deprivation and disease in Europe and North America (Corburn 2009). In the United Kingdom, poor health in new industrial cities persisted from the 1820s to the 1870s, with life expectancies dropping to levels not seen since the plague in 1348 and 1349 (Szreter and Mooney 1998). Figure 2.11 illustrates that life expectancies in British cities were markedly lower than national averages in the 1830s and 1840s at a time of 'epidemiological crisis' (Szreter et al. 2003).

Figure 2.9: Life expectancies at birth in major British provincial cities, 1801-1901 compared with national averages



Source: Szreter and Mooney (1998)

The scourge of disease and deprivation motivated several government reports on unsanitary conditions. Among the most influential was Sir Edwin Chadwick's 1842 *Report from the Poor Law Commissioners on an Inquiry into the Sanitary Conditions of the Labouring Population of Great Britain* (hereafter referred to as the Chadwick Report) (Morley 2007). The Chadwick Report was the first to show that disease was strongly correlated with socio-economic inequalities between neighbourhoods, and to argue that corresponding health inequalities could be remedied through government policy (Corburn 2009). The report's sweeping recommendations ranged from the construction of new public housing to neighbourhood infrastructure improvements targeting water and sanitation, drainage and sewerage, and solid waste management. Chadwick's recommendations were aimed at cleaning up the 'miasma', the idea that disease emanated from garbage, foul air, waste water, slums, and rotting organic matter (ibid). The Chadwick Report transformed public policy in the United Kingdom, leading to the formation of

the Healthy Towns Commission in 1843 and to the establishment of the first *Public Health Act* of 1848 (Morley 2007). It also strongly influenced public policy in Canada and the United States (Corburn 2009).

When dispersing environmental miasmas did not appear to reduce disease, new public health theories emerged (Corburn 2009). Contagion theory, the idea that disease was caused by emanations from the body, became dominant in the 1880s based on the observation that people exposed to those infected with the bubonic plague fell ill themselves (Hardt 2005). The chaos that accompanied the plague led to mass quarantines, often of minorities and immigrants based on a belief that they were inherently more vulnerable than Europeans (Corburn 2009).

By the end of the nineteenth century, physical interventions to remove miasmas and sick people dominated public health (Corburn 2009). Although these interventions led to large reductions in disease, their success was not always for the reasons assumed (Hardt 2015). Chadwick's assumption that disease was attributed primarily to poor environmental conditions was eventually disproven, although his approach to protecting public health remains equally valid today given the prevalence of environmental health problems (malaria, dengue, diarrhoea) in many parts of the global South, where urbanisation has not been effectively planned and managed (Hardoy et al. 2001), as discussed above.

The co-establishment of modern urban planning and public health

The increasingly scientific understanding of disease, combined with the experience of industrialisation and urbanisation in the mid-nineteenth century, led to a new urban planning agenda in the United Kingdom, Europe and the United States (Northridge et al. 2003; Northridge and Sclar 2003; Corburn 2009; Barton and Grant 2013; Peterson 2017). This agenda responded to the haphazard and unregulated nature of urban development, then dominated by private interests (Peterson 1979). In view of the public health impacts of urban development, and informed by statistics linking disease to unsanitary conditions, urban reformers proposed radical new visions that were to transform the structure of cities in the nineteenth and early twentieth centuries (Peterson 2017; UN-Habitat 2009; Watson 2009). Table 2.6 summarises the different ways in which the visions of the reformers, known today in professional planning practice as the 'fathers of town planning', approached the treatment of urban health and the implications for modern urban/city planning.

Table 2.6: The 'fathers of town planning'

Reformer	Background	Vision	Treatment of urban health and planning implications
Ebenezer Howard (1850-1928)	English town planner	People and jobs should be relocated from large cities to 'garden cities' in the countryside characterised by radial layouts, interspersed parks, greenbelts and high speed rail connections (the 'New Town Movement')	A return to country living in small town environments will promote health, whereas living in modern industrial cities breeds crime, disease and deprivation
Georges-Eugène Haussmann (1809-1891)	French public administrator (no training in planning/ architecture)	City beautification through urban renewal and 'slum' clearance and the introduction of parks, squares and boulevards, exemplified by his plan to redevelop Paris (the 'City Beautiful Movement')	'Slums' are sites of disease and deprivation and therefore need to be removed to make way for modern amenities
Patrick Geddes (1854-1932)	Scottish biologist, sociologist, geographer, and planner	Regional planning based on the principle of balancing human settlement with nature and localised interventions to improve living conditions (the 'New Town Movement')	Urban health is influenced by interactions in socio-ecological systems and requires localised approaches that address the balance between humans and nature
Le Corbusier (1887-1965)	French architect	Mixed-use areas and 'slums' should be demolished to make way for the 'modern city' based on larger tower blocks surrounded by vast open spaces and connected via large arterial corridors (the 'Tower in the Park' model)	Traditional inner-city areas, characterised by dense and heterogeneous built environments and local street networks create disorder, chaos and disease and need to be removed to make way for modern urban form
Frank Lloyd Wright (1867-1959)	Architect	Inner-city areas of modern cities should be abandoned in favour of sprawling low-density residential areas characterised by single-detached dwellings, curvilinear street patterns and automobile dependency catering	Low densities, segregated land-uses, automobile reliance and homogenous social environments promote health

		primarily to the middle-class (the 'suburbia' model)	
Frederick Law Olmsted (1822-1903)	American landscape architect	Large parks provide clean air for urban dwellers to breathe, exemplified by Olmsted and his partner Vaux's design of Central Park in New York City (the City Beautiful Movement)	Large parks serve as 'lungs of the city' (green spaces where urban dwellers can breathe clean air, echoing miasma theory)

Developed by author, informed by Watson (2009) and UN-Habitat (2009)

The visions outlined in the Table above support three different approaches to urban restructuring (Reissman 1964). The first approach sought to transform cities into healthier and more aesthetically pleasing living environments through the removal of congested inner-city areas and 'slums' to make way for parks, squares and boulevards (as advocated by Haussmann) and through the introduction of large parks to provide urban dwellers with clean air to breathe (as advocated by Olmsted). This approach inspired the City Beautiful Movement in urban planning, design and landscape architecture. The second approach sought to build small satellite towns connected to central cities via rail networks and surrounded by greenbelts (as advocated by Howard). This group inspired the New Town Movement in urban and regional planning. The third approach sought to replace the perceived chaos of inner-city areas with modernist urban form characterised by large towers surrounded by vast open space (as advocated by Le Corbusier). This approach inspired the Tower in the Park Model in urban planning and architecture (ibid). However, Geddes defies simple categorisation; in some cases, he supported the introduction of small open spaces and improvements to existing infrastructure, while in other cases he supported the Garden City as a regional planning solution.

While the visions of the urban reformers varied, they shared several ideologies (Corburn 2009; Home 2013; UN-Habitat 2009; Watson 2009). The first was based on a common belief in moral environmentalism, the idea that disease and delinquency were caused by poor living environments. As Huxley (2006) argues, this belief justified the notion of 'governable spaces' in which the state exercised its powers to rid the city of medical and moral decay through physical interventions. This belief was well suited to colonialism, which supported planning as a means of ordering and controlling the built environment (Home 2013), as discussed below.

The second ideology was based on scientific rationality arguments to justify physical interventions. The idea that planning decisions could be made rationally based on scientific laws or 'truths' led to a positivist view of planning as a technical, apolitical activity. Positivism in

planning was linked to utilitarian ideas of spatial organisation and public health, which sought to achieve 'the greatest good for the greatest number' and which led to an increased regulatory role of the state in "classifying, segregating and controlling" (Home 2013: 51). Positivist driven planning has typically come at the expense of marginalised groups living in inner-city areas (UN-Habitat 2009).

The third ideology viewed planning as a physical intervention that could be used to address social and environmental problems—a view shared by sanitarians (such as Chadwick). These problems were seen as physical rather than social or political; planning was commonly termed 'physical planning' in the early twentieth century. To realise their visions, urban reformers relied on master plans to guide the physical growth of the city through development control, including land use regulations, building codes, and zoning bylaws (Watson 2009). Planning was subsequently viewed as a technical activity undertaken by technocrats with little to no community involvement.

The fourth ideology viewed planning as a normative task driven by a set of values embodied in ideal urban form. The objective of planning was to create 'the good city' in which people would live in 'proper' environments characterised by order and efficiency, epitomised by the Tower in the Park model (Watson 2003). This notion justified 'slum' clearance in many European and North American cities to make way for the plans of the reformers (Home 2013). Similar notions have been used to justify the clearance of unplanned settlements in the global South, as discussed below.

The fifth ideology viewed planning as a universally valid proposition that could be replicated anywhere, regardless of local circumstances. Planning subsequently came to be viewed as a 'technology' for achieving modern urban form (Healey 2011). This view enabled planning to be exported from Europe and North America to other parts of the world through colonisation and globalisation (Watson 2009). In the case of the former, 'town planning missionaries' were frequently commissioned by colonial authorities to plan towns and cities based on reformers' visions—in particular, the Garden City (Home 2013). While Geddes was a planning missionary, his view of planning was somewhat less universalist. Rather than seeing the city as an object that could be arbitrarily imposed on a place, Geddes viewed the city as a product of the environment, to be planned as part of it (Marshall and Batty 2009).

The last ideology viewed planning as a discipline undertaken by predominately male professionals. As a result, many towns and cities were planned principally "by men for use by other men" (Home 2013: 56). Consequently, women and families were frequently disregarded

in the planning and ordering of urban space (ibid). In modern transport planning, for example, it is assumed that most commuter trips are undertaken by men (typically viewed as breadwinners) using private automobiles, without recognising that this means of transport is largely unaffordable to most poor women, who tend to dominate public transport users (Levy 2013).

Modern urban planning and public health in the colonial era

The sanitary reforms of colonial governments in India and various African colonies were concomitant with the public health movement in the mid-nineteenth and early twentieth centuries (Swanson 1977; Home 2010). Curtin's (1985) historical review found that colonial administrators in Africa began applying public health theories to protect Europeans from disease as early as the 1800s. At the time, miasma theory assumed that diseases endemic to specific areas (such as malaria) emanated from the soil, which led colonial governments to construct houses on stilts. Conversely, contagion theory assumed that certain diseases (such as small pox and plague) spread through releases from the body of an infected person, which led colonial governments to adopt policies of residential segregation based on quarantine principles (ibid).

Medical ideas began to change in the 1870s with the emergence of germ theory based on the discovery that micro-organisms caused parasitic diseases (such as malaria and yellow fever) (Curtin 1985). While germ theory led to a shift in Western medical science toward preventative health care measures (such as vaccines) (Awofeso 2004), colonial administrators continued to rely on miasma and contagion theories to justify residential segregation based on a belief that the unsanitary living practices and racial characteristics of indigenous populations were the causes (Swanson 1977; Curtin 1985; Home 2013). This belief is captured by one colonial administrator's description of residential segregation:

> "The first object of the non-residential area [also referred to as a 'building-free zone', 'neutral zone' or 'green belt'] is to segregate Europeans, so that they shall not be exposed to the attacks of mosquitoes which have become infected with the germs of malaria or yellow fever, by preying on Natives, especially Native children, whose blood so often contains these germs. It is also valuable as a safeguard against bush fires and those which are so common in Native quarters, especially in the dry season… Finally, it removes the inconveniences felt by Europeans, whose rest is disturbed by drumming and other noises dear to the Native" (Lugard 1919: 420, quoted in Home 2013: 124).

With the re-emergence of plague in many African port cities at the beginning of the nineteenth century, the rationale for segregation became increasingly racist and more difficult to justify on medical grounds (Curtin 1985). Urban planning subsequently became one of the primary tools of racial segregation in many African colonies, including Angola, Sierra Leone, Côte d'Ivoire, Guinea, Congo, Nyasaland (present day Malawi), Kenya, Tanganyika (present day Tanzania), Northern Rhodesia (present day Zimbabwe), Madagascar, and South Africa, among others (Swanson 1977; Home 2010; Njoh 2014). Some of planning's most deliberate practices of racial segregation included:

- The requirement that African settlements be located between 300 and 440 yards away from European settlements based on a belief that Africans—in particular, African children—were genetically predisposed to malaria, and an estimation that the *Anopheles* mosquito could not fly a greater distance from the African population, although this distance was not known (Curtin 1985).
- The use of racial zoning to separate Europeans from native populations in coastal West Africa and particularly South Africa. This practice contrasts with the use of zoning to separate incompatible land uses (such as industrial and residential) in Europe—a practice that originated in Germany (Njoh 2009; Home 2010; Curtin 2016).
- The Garden City to relocate African populations to the periphery of apartheid Johannesburg (South Africa). Among the first relocation projects was Pimville Klipspruit (present day Klipspruit), the precursor to Soweto (Home, 2013). Garden Cities were also planned for whites. Albert Thompson's (1878-1940) plan for Pinelands Garden City in Cape Town, designed in 1920-1924, became a model for planning self-contained white-only low-density housing areas in South Africa and other African countries. Thompson believed that the Garden City model would improve health for whites following the influenza pandemic (ibid).
- The application of the *Slums Act* of 1934 in apartheid Johannesburg to remove congested 'slums' and rehouse evicted working-class Africans in peripheral areas (Parnell 1988). 'Slums' were replaced by housing for working-class whites and industrial expansion projects. The adoption of the *Slums Act* was motivated by the plague of 1904 and subsequent epidemics and had a profound and enduring impact on reinforcing residential patterns of racial exclusion in the South African city (ibid).
- The introduction of 'pass laws' by South African authorities to restrict the African population from accessing the 'white city' (Swanson 1977).
- The introduction of 'buffer strips' and green belts to physically separate European settlements from indigenous populations in various colonial African cities (Home 2013).

- The construction of European Residential Areas (ERAs) to house Europeans in large compounds in Nigeria. Except for domestic servants, natives were not permitted to live in ERAs (Home 2013).
- The use of concentric zones around cities to exclude Africans from certain areas. In Conakry (Guinea), a person had to be able to afford at least 7.5 Francs per square metre to live in the first zone, while the cost of land development in the second zone was 4 Francs, and 1.5 Francs in the third zone (Njoh 2008). In Khartoum (Sudan), land was zoned into three 'classes': the first was reserved for British administrators; the second was reserved for Egyptian officials, businessmen and other lower-class groups; and the third was reserved for natives (Home 2013).
- The separation of European settlements from traditional African settlements based on the doctrine of 'Indirect Rule' or the 'Dual Mandate', which "sought to keep 'native' society separate from Western influence" (Home 2013: 136). In Kano (Nigeria), traditional African compounds in the old walled city were avoided by Europeans and excluded from urban renewal schemes (ibid).
- The exclusion of the African urban majority from accessing formally planned settlements by making the costs of conforming to building regulations, particularly those requiring European building materials (such as cement, steel, glass, tiles, and corrugated metal roofing sheets), unaffordable (Njoh 2009). Thus, even where explicit policies of racial segregation were not in place, indigenous populations were excluded from European settlements (ibid).

Swanson (1977) argues that segregationist planning policy was influenced by a societal metaphor that viewed infectious disease in terms of racial differences (the 'sanitation syndrome'), and that this metaphor shaped the policies and institutions of urban segregation in colonial societies. Njoh (2009) further argues that, far from being a benevolent attempt to promote public health, colonial planning policies represented an agenda to reinforce colonial control over African territories.

Other colonial planning policies included the clearance of congested 'slums' to make way for wide streets intended to bring clean air, light and drainage to highly populated areas (echoing Haussmannian planning and miasma theory) (Home 2013). In most cases, the displacement of indigenous populations, usually without compensation, exacerbated overcrowding and unsanitary conditions in other parts of the city by reducing the amount of land available for housing. Many colonial administrators were ostensibly unaware that such conditions were largely the result of segregationist planning policy and systematic neglect. It certainly would

have been much easier to blame public health problems on the cultural deficiencies of natives than to address the structural causes linked to poverty, inequality and economic exploitation (ibid).

By the 1930s and 1940s, planning had become institutionalised in most African colonies through the introduction of Town Planning Acts, many of which were derived from the 1932 English *Town and Country Planning Act* (including Malawi's first 1948 Act) (Njoh 2009; Home 2013). While there was growing enthusiasm for planning as the colonies became independent, there was concern that the newly emerging nation-states lacked the capacity to implement planning regulations and meet all needs for housing and services, that planning lacked a locally relevant theoretical basis to inform practice, and that traditional planning and survey methods were too cumbersome. These concerns mounted in the post-independence era with rapid rural-urban migration and the proliferation of unplanned settlements (Home 2013).

Urban planning and public health in the independence era

Despite their common origins in the sanitary reform era, urban planning and public health have become gradually disconnected (Corburn 2009). By the turn of the twentieth century, public health shifted from a focus on the physical environment based on miasma and contagion theories toward preventative health measures based on germ theory aimed at immunising and curing hosts, with an interest in 'high-risk groups' (such as women, school-children, and the elderly) (Awofeso 2004). Public health subsequently became dominated by physicians and clinicians focused on individual risk factors (such as behaviours, lifestyles, genetics and hereditary biology) and therefore modern medicine rather than societal risk factors (such as the physical environment), and urban planning (Corburn 2009).

The evolution of urban planning is somewhat more difficult to trace given the many forms it takes in different parts of the world (UN-Habitat 2009; Watson 2009). In many sub-Saharan African countries, older forms of master planning inherited in the colonial era persist, despite rapidly changing urban realities linked to the urbanisation of poverty and the growth of informal settlements (Berrisford 2011; Watson 2009). The mounting evidence showing that urban health inequalities between 'slum' and 'non-slum' populations have become increasingly linked to the environment in sub-Saharan Africa and other parts of the global South indicates a large and growing gap between urban planning and its original mandate to protect and promote public health (Hardoy et al. 2001; Kjellstrom et al. 2007; Lilford et al. 2017).

Interest in urban health it re-emerged in the 1970s with the introduction of two concepts (Vlahov et al. 2004). The first is the 'urban health penalty', "which posits that cities concentrate poor people and expose residents to unhealthy environments leading to a disproportionate burden of poor health" (ibid: 1134). The second is 'sprawl', which describes the rapid suburbanisation of European and North American cities and attendant health impacts associated with air pollution, physical inactivity and road traffic accidents (see Frumkin 2002). This latter concept moved beyond the 'urban health penalty' and its focus on poverty in inner-city areas toward predominately middle- and upper-income suburbs (Vlahov et al. 2004).

To bring these two approaches together, researchers have argued for a return to a focus on urban living conditions as a principal health determinant (Vlahov et al. 2004; Freudenberg et al. 2005). This shift is particularly important in sub-Saharan Africa, and the global South more broadly, where there is mounting evidence of an 'urban health penalty' experienced by 'slum' dwellers (see Lilford et al. 2017). The interest in 'slum health' began in the 1970s after many former colonies gained independence and began to receive international aid. At the time, there were very few demographic and health data at the intra-urban scale beyond several reports published by the United Nations Children's Fund (UNICEF) showing high infant and child mortality rates in informal settlements (see Basta 1977). Motivated by this evidence, academic activists, such Ward, Turner, Illich, Mead and Schumaher, played an instrumental role at Habitat I in 1976—the first United Nations Conference on Human Settlements—in shifting away from a focus on national governments toward the role played by local/urban governments and civil society (including community-based organisations) in health promotion and disease prevention (Parnell 2016).

Interest in urban health grew in the 1980s following the release of a widely cited book, *In the Shadow of the City,* by Harpham et al. (1988), which drew attention to the scale and nature of urban health issues in low- and middle-income countries. The book built on a seminal paper published by the WHO and UNICEF (Rossi-Espagnet 1984) that questioned the prevailing focus of international organisations on rural health by emphasising two emergent trends. The first was the rapid urbanisation of low- and middle-income countries; and the second was the growth of low-income informal settlements and the urban inequities that resulted. Harpham et al. substantiated these trends by drawing on case studies demonstrating the scale of urban health inequities in rapidly urbanising countries. The evidence was drawn on in later Chapters on health care policy to emphasise poverty as the root cause of urban health inequities, and to call for health care services to shift away from curative to preventative measures in order to improve the health of the urban poor.

The growing awareness of urban health inequities was demonstrated when the first international work-shop on urban health care issues was held by OXFAM, UNICEF and the Overseas Development Administration in 1985, with funding from the London School of Hygiene and Tropical Medicine (Harpham and Stephens 1992). The proliferation of workshops and meetings on urban health during the 1980s motivated the publication of a second influential book, *Spotlight on the Cities,* by Tabibzadeh et al. (1989). In just five years, urban health had gone from being 'in the shadow' to being 'in the spotlight' (Harpham and Stephens 1992).

Two parallel movements emerged to address the needs of the urban poor: the housing and urban development sector, and the health sector (Harpham and Stephens 1992). Both sectors prioritised 'slum' upgrading as a main way of improving the health of the poor, as emphasised at Habitat I. Most slum upgrading programmes were supported by municipal authorities in Asia and especially India (ibid). However, evaluations of the share of international assistance that went to urban poverty reduction programmes from the late 1970s to the mid-1990s uncovered minimal financial support for housing initiatives and the provision of basic services, including health care, water and sanitation, drainage, liquid and solid waste management, and other development deficits (Satterthwaite 1997).

In the late 1980s and 1990s, evidence of the relationship between environmental conditions in and around the home, neighbourhood and city was expanding, as demonstrated by several landmark books and reports (see World Bank 1993; Bradley et al. 1992; Stephens et al. 1996; Harpham et al. 1988; Hardoy et al. 1990). Researchers led by Bradley et al. (1992) at the London School of Hygiene and Tropical Medicine revealed widening intra-urban differentials in morbidity and mortality between the rich and poor based on multi-country analyses of DHS data, revealing 'a new urban penalty', especially in Africa (see Gould 1998). This evidence came at a time when many African countries were struggling with declining urban economic and environmental conditions following the implementation of structural adjustment programmes (Simon 1997), as discussed above (section 2.1.1). There was increasing concern that Africa's 'urban crisis' was deepening the 'urban poverty penalty', especially for children (Satterthwaite et al. 1996; Gould 1998).

The evidence of urban health inequities in both developed and developing regions was persuasive enough for the WHO to establish the Healthy Cities Movement in 1987 (Box 2.1) and for donors and international agencies—notably the WHO and UNICEF—to introduce urban health programmes (see Fluty and Lissfelt 1995; Goldstein et al. 1995; Hecht 1995; Merkle and Knobloch 1995; Padmini 1995). Meanwhile, international reports on sustainable development began to feature sections and Chapters on health in urban areas and informal settlements,

including *Our Common Future,* the report by the World Commission on Environment and Development (known as the Brundtland Commission), which was published in 1987, and *Our Planet, Our Health*, the report by the World Health Organization (WHO), which was published in 1992.

Box 2.1: The Healthy Cities Movement

The Healthy Cities Movement was launched by WHO in 1987 to revitalise the role of local government in response to mounting urban health inequalities. The project was based on the Healthy City concept, which was strongly influenced by the sanitary reformers of the mid- to late-nineteenth century. While the concept is rooted in the historical role of local government in sanitation, it has been expanded to address the need to involve communities, civil society and the private sector in urban health promotion. Hancock and Duhl (1986) define a Healthy City thus:

> "A healthy city is one that is continually creating and improving those physical and social environments and strengthening those community resources which enable people to mutually support each other in performing all the functions of life and achieving their maximum potential" (ibid: 13).

The Healthy Cities Movement has proven extremely popular—in the first five years, it expanded from 11 to 35 cities and now includes over 1,400. However, it remains largely confined to Europe and to a lesser extent North America, despite efforts in the early 1990s to expand the Healthy Cities Movement to the global South. The movement has also been dominated by large cities.

Informed by Duhl (1986), Handcock (1993) and Taylor (2010)

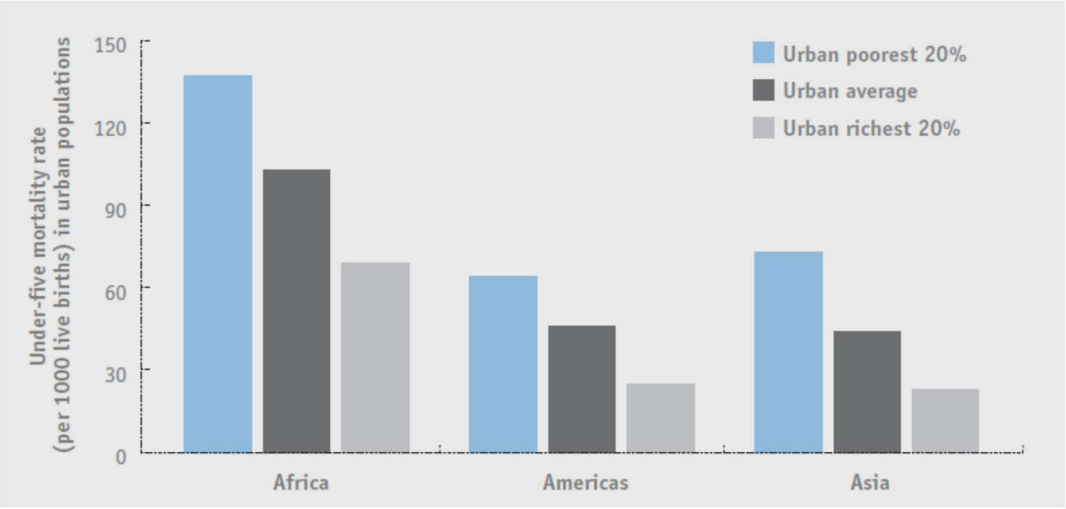
At Habitat II in 1996, the emphasis remained on housing and 'slum' upgrading and on managing the rapid urbanisation of the global South (Parnell 2016). Materials prepared to inform Habitat II were supported by UNICEF and included a book, *The Environment for Children,* authored by staff of the International Institute for Environment and Development, the Bartlett Development Planning Unit and the London School of Hygiene and Tropical Medicine (Satterthwaite et al. 1996). Efforts in the 1990s to increase the body of scholarly literature on urban health were marked by the establishment of the *Journal of Urban Health* in 1998. Special issues were also dedicated to urban health in other journals, notably *Environment & Urbanization*, which covered health and well-being in 1993 and healthy cities in 1999.

Research on health in urban areas and informal settlements continued into the 2000s, including special issues in *Environment & Urbanization* dedicated to water, sanitation and drainage in 2002, health and the city in 2011, sanitation and drainage in cities (two issues) in 2015, and the

spectrum of risk in urban areas in 2017. The *Journal of Urban Health* also dedicated a special issue to urban health inequities in 2007, which included a strong emphasis on the links between urbanisation, slum formation and ill-health (see Vlahov et al. 2007). This expanding body of work has continued to uncover differentials in morbidity and mortality rates and the prevalence of life-threatening diseases between low- and high-income neighbourhoods, the continued lack of demographic and health data disaggregated for cities and small area units, especially in sub-Saharan Africa (as discussed in the previous section), and the continued reluctance of international agencies to support urban development programmes (Hardoy et al. 2001; Harpham and Molyneux 2001; Montgomery et al. 2004; Harpham 2009; Sverdlik et al. 2011; Mitlin and Satterthwaite 2013; Lilford et al. 2017; Satterthwaite et al. 2018b).

There is good reason to be especially concerned about urban health in Africa. Data compiled by the WHO show that under-five mortality rates among the poorest urban quintile are higher in Africa than in other developing regions (Figure 2.12), suggesting that the 'urban poverty penalty' is disproportionately borne by African 'slum' dwellers. Similar patterns have been observed at the demographic and health surveillance site for Nairobi (Kenya), which indicates that under-five mortality rates are higher in 'slums' than national and rural averages (Kyobutungi et al. 2008), as reviewed above (section 2.1.4).

Figure 2.10: Under-five mortality rate in urban areas by region in 42 low- and middle-income countries, 2000-2007



Source: WHO and UN-Habitat (2010)

The existence of intra-urban mortality differentials is explained in part by data showing large basic service deficits in African urban centres and large variations in levels of service provision between 'slum' and 'non-slum' populations (Mitlin and Satterthwaite 2013). It is not uncommon

for up to 70% of the population in many African towns and cities to live in informal settlements (ibid; see also UN-Habitat 2003). Furthermore, recent data show that the share of the urban population with access to piped water to premises and/or improved sanitation has decreased in several sub-Saharan African countries, including Malawi, Namibia, Nigeria, Rwanda, Sierra Leone, Zambia and Zimbabwe between 1990 and 2015 (Satterthwaite 2016b). While variations in the urban condition negate generalisations, the evidence indicates that the urban health situation in sub-Saharan Africa is among the poorest in the world, that the urban poor disproportionately suffer from the burden of communicable and non-communicable disease, and that a large share of this burden is preventable through action on environmental and municipal determinants (Hardoy et al. 2001; Harpham and Molyneux 2001; Harpham 2009; Sverdlik 2011; Mitlin and Satterthwaite 2013; Smit and Parnell 2012).

For reasons that remain unclear, the WHO and UNICEF shifted away from a focus on health issues in urban centres and informal settlements and the role of local government and civil society in health promotion in the late 1990s and early 2000s (Mitlin and Satterthwaite 2013). Satterthwaite (interview) attributes this shift to staff turnover at WHO, the difficulties experienced by official development assistance agencies in working with local governments and communities, and a longstanding apathy toward urban issues by many national governments and international agencies.

Getting urban health on the policy agenda has been particularly challenging in sub-Saharan Africa, where municipal governments generally do not play a strong role in urban planning and development due to their limited capacities and the unwillingness of national governments to implement decentralisation and support urban development (Rakodi 1997; McGranahan et al. 2009; Watson 2009; Resnick 2014). The Healthy Cities Movement has been slow to emerge in the region for this and other reasons, including the low priority given to the urban environment and health, limited formal networks, high reliance on foreign support, and insufficient resources (Taylor 2010). Consequently, participating African cities are few, while those that exist are distributed unevenly between countries and regions (see Simos et al. 2017). The Movement remains dominated by European and North American cities (ibid).

African scholars (Oni et al. 2016) from the Research Initiative for Cities and Health (RICHE) at the University of Cape Town have recently come together to address the lack of an African perspective on urban health. They identify six priority themes for research and practice:

1. Obesity and food insecurity
2. Urban context as a tool for health promotion

3. Urban health governance and policy
4. Community strengthening for healthy inclusive cities
5. Health systems in an urbanising context
6. Migration, urbanisation and health

The approach supported by Oni et al. (2016) is based on the recognition that urban health is an inter-disciplinary field that requires the involvement of more than just public health practitioners, but also built environment and medical professionals. A sub-set of this group (Smit et al. 2011; Smit and Parnell 2012) have joined planning scholars in Europe and North America (Frumkin 2002; Northridge et al. 2003; Northridge and Sclar 2003; Corburn 2009) to argue for urban planning and public health to be reconnected given the strong links between health and the urban environment.

For Euro-American commentators, such as Corburn (2009), the question is:

> "How can modern city planning, a profession that emerged in the late nineteenth century with a goal of improving the health of the least-well-off urban residents but lost this focus throughout the twentieth century, return to its health and social justice roots?" (ibid: 1).

This question is posed in the context of the United States, where modern urban planning played a key role in sanitary reform, as in the United Kingdom. However, whereas modern urban planning in Europe and North America supported large-scale infrastructure and housing programmes to improve the health of the poor and society at large in the mid-nineteenth and early twentieth centuries (Corburn 2009), urban planning in many sub-Saharan African countries was introduced by colonial administrations to protect the health of Europeans from 'pathogenic' native populations (Home 2013; Parnell 1988; Swanson 1977). In such cases, modern urban planning was not necessarily concerned with improving the health of the least-well-off. This begs the question of whether urban planning and public health in the former colonies were ever genuinely connected in the first place.

Critiques of urban planning and management in Africa have grown since the late 1980s, when scholars began to recognise the failure of traditional master planning frameworks inherited from the colonial era, the rapidity of urban growth accompanied by the expansion of informal settlements, the lack of spatial policies that address the geographic location of urban and rural development, and the growing number of stakeholders (including the private sector, NGOs, traditional authorities, households) involved in urban management in the absence of decentralised governance structures (see, for example, Simon 1984; Stren and White 1989;

Mabogunje 1990; Simon 1992; Wekwete 1997). Since independence, most attempts to plan and regulate urban space in Africa have failed (Mabogunje 1990; Okpala 2008; Watson 2009; Silva 2012; Goodfellow 2013), manifested by the proliferation of unhealthy living environments, particularly in informal settlements (Bradley et al. 1992; World Bank 1993; Stephens et al. 1996; Harpham et al. 1988; Hardoy et al. 2001; Lilford et al. 2017). There are thus serious questions concerning whether urban planning, in its current form, is capable of effectively managing Africa's urban transition (see, in particular, Watson 2009).

Against this historical backdrop, the following Chapter introduces a new framework to re-imagine the prospects for planning healthy urban environments from an African perspective. In doing so, it builds on Smit et al. (2011) and Smit and Parnell (2012) by bringing critical perspectives on the role of urban planning in Africa's urban transition into the debate, raising important insights for emerging efforts to reconnect urban planning and public health in Africa and elsewhere in the global South.

2.2 Conclusion

This Chapter used the themes identified in Chapter One (section 1.4) to review debates central to the research problematic—i.e. to understand how processes of in situ urban change are influencing the nature and scale of environmental health risks and outcomes in emerging African towns and the prospects for planning healthy urban environments in these increasingly important urban contexts. Five themes were combined to form the following narrative:

- ***African urbanisation***: The continent is urbanising in exceptional ways relative to other regions;
- ***Smaller African urban centres***: They account for a large and typically growing share of urban growth in the region;
- ***Rural transformation***: Smaller urban centres have the potential to transform rural territories to the benefit of poor rural populations;
- ***Urban risk***: Environmental health hazards threatens to undermine smaller urban centres' growth and development potential; and
- ***Urban planning***: The ability to effectively plan healthy urban environments is a pre-condition for smaller urban centres' growth and development

The following Chapter presents a new analytical framework designed to explore the problematic, as stated above.

Chapter 3 Analytical framework

The renewed interest in urban health, discussed in the previous Chapter (section 2.1.5), has motivated several scholars to propose frameworks for understanding the health impacts of urban living (see Frumkin 2002; Northridge et al. 2003; Northridge and Sclar 2003; Schulz and Northridge 2004). These frameworks have emphasised the determinants of urban health primarily in the physical and institutional environment, but have not resulted in research that incorporates the many other determinants of health in urban settings (Galea et al. 2005).

Galea et al. (2005) propose an alternative framework that combines the social, economic, environmental and municipal/institutional determinants of urban health in relation to evolving social structures, governance reforms, suburbanisation and globalisation. While this framework represents one of the most holistic and dynamic to date, it is grounded in the histories and geographies of the United States. It therefore does not sufficiently recognise or engage with the exceptional nature of Africa's urban transition (specifically its low urbanisation level and high urbanisation rate), the particular implications this transition presents for urban health, or the need for African perspectives on urban health research and planning practice in this context.

This Chapter introduces a new framework with the following aim: to understand how processes of in situ urban change are influencing the nature and scale of environmental health risks and outcomes in emerging African towns and the prospects for planning healthy urban environments in these increasingly important urban settings. The framework builds on Galea et al. (2005) insofar as it adopts their core assumption "that urban populations are defined by size, density, diversity, and complexity, and that health in urban populations is a function of living conditions that are in turn shaped by municipal determinants and global and national trends" (ibid: 1017). The framework departs from Galea et al. by grounding itself in the history and geography of sub-Saharan Africa and its late urban transition; by focusing specifically on health risks and outcomes with known environmental causes; by incorporating perspectives on gender, urban change, socio-ecological systems and urban governance; and by situating these perspectives in time and place.

These points of departure follow those supported by the Urban Africa Risk Knowledge (Urban ARK) project, namely the spectrum of risk and its social construction, and the governance and urbanisation of risk, as discussed in Chapter One (section 1.1). The aim is to integrate emerging debates on urban risk trajectories within and beyond Urban ARK (see, in particular, Pelling and Wisner 2009; Dodman et al. 2017; Fraser et al. 2017) with those on planning healthy urban environments in sub-Saharan Africa, and the global South more broadly (see, in particular, Smit

et al. 2011; Smit and Parnell 2012). The framework therefore speaks not only to Urban ARK, but also to nascent debates on the role of urban planning in health promotion and disease prevention in urbanising territories exposed to multifarious environmental hazards.

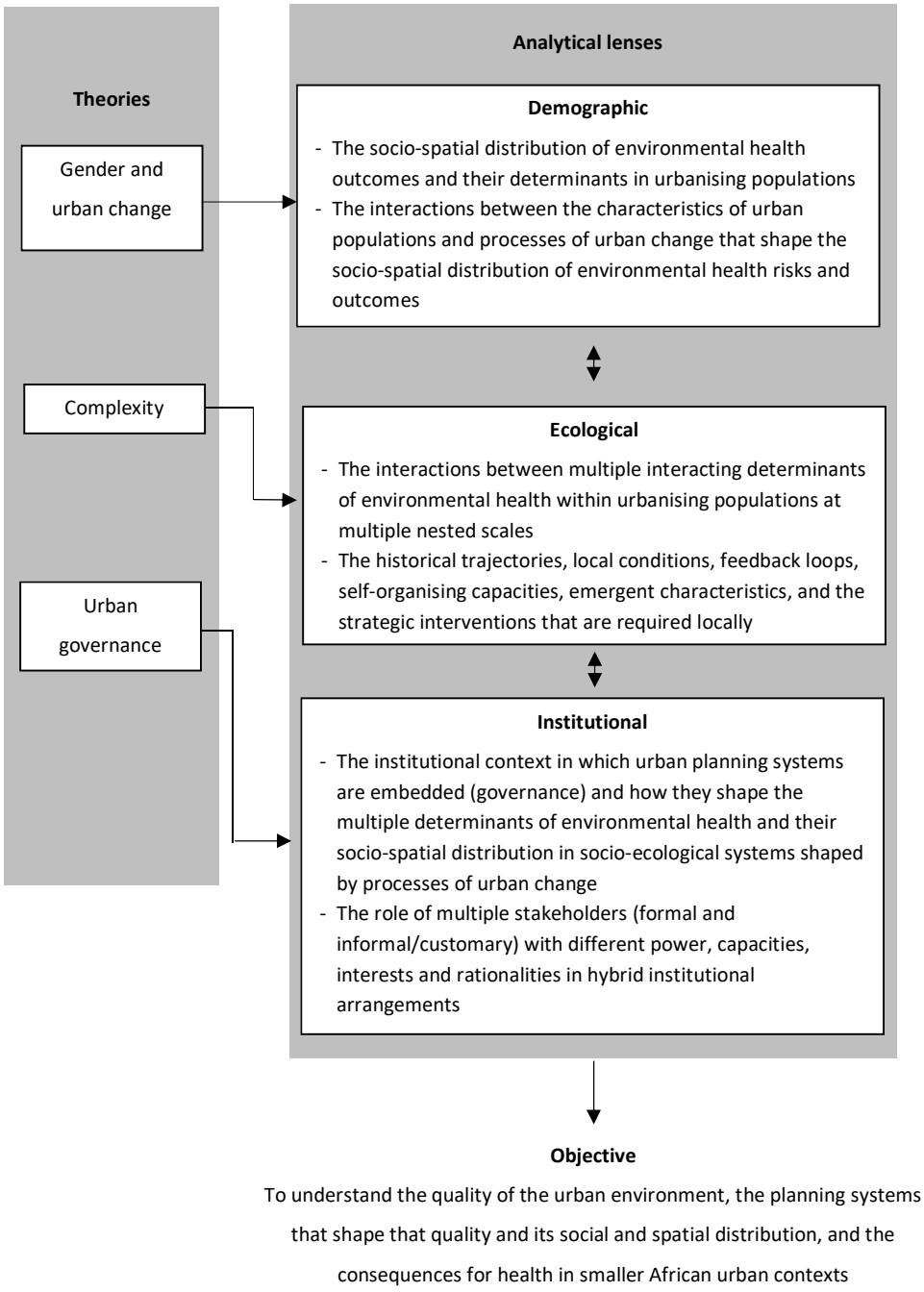
This Chapter outlines the three analytical lenses that guide the framework. It concludes by discussing how it advances the African perspective on urban health and planning practice that Oni et al. (2016) and others (Smit et al. 2011; Smit and Parnell 2012) have called for, as reviewed in Chapter Two (section 2.1.5).

3.1 Analytical lenses

The framework introduced in this Chapter is guided by three analytical lenses, summarised in Figure 3.1:

- ***Demographic lens**:* Analysing the socio-spatial distribution of environmental health in urbanising populations, drawing on insights from gender and urban change literature;
- ***Ecological lens**:* Analysing the interactions between the determinants of environmental health across the full spectrum of hazards (everyday, small and large) at multiple nested scales (individual, household, neighbourhood, town-wide, national, international), drawing on socio-ecological systems theory; and
- ***Institutional lens**:* Analysing the urban planning systems that shape the quality of the urban environment and related health risks and outcomes, drawing on theories of urban governance.

Figure 3.1: Analytical framework

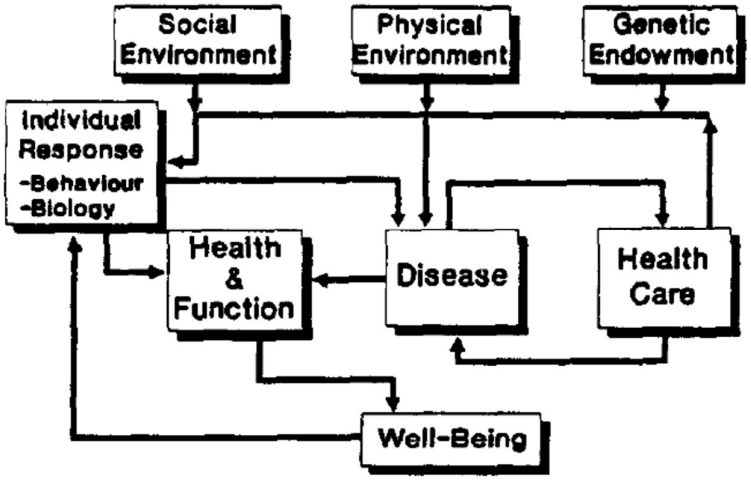


The major conceptual aim of the framework is to operationalise Healey's (2011) notion of 'contingent universals'; "understanding what is specific to a place and what can be shared learning across different localities and contexts" (Watson 2016: 38). This notion supports a growing emphasise on case study research as a means of supporting what Yin (1994) calls 'analytical generalisation', whereby empirical insights, if detailed enough, can be generalised to similar cases to test causal processes and build theories of observed phenomena and relationships. This approach has been supported in urban planning and geographic research as a way of understanding the differences and commonalities between urban centres shaped by processes of urban change (Watson 2003; Flyvbjerg 2006; Robinson 2016; Watson 2016), as discussed in Chapter Four (section 4.3). To that end, the framework is proposed with the aim of illuminating further work in under-studied and marginal urban locations.

3.1.1 Demographic lens

The concept of population health emerged in the 1970s to address the relationship between the non-medical determinants of health in the social and physical environment (for example, Blum, 1974). Evans and Stoddart (1990) presented one of the first conceptual frameworks for understanding the multiple determinants of population health (Figure 3.2), which has influenced a number of subsequent frameworks, each serving to refine understandings of these determinants (Galea et al. 2005). Whereas conventional health care policy focuses primarily on preventing and curing diseases among individuals based on their behaviour and biological characteristics, population health focuses on broader changes to the social determinants of health (the 'causes of the causes' of disease) (Marmot et al. 2008).

Figure 3.2 : An initial framework of the different determinants of population health



Source: Evans and Stoddart (1990: 1356)

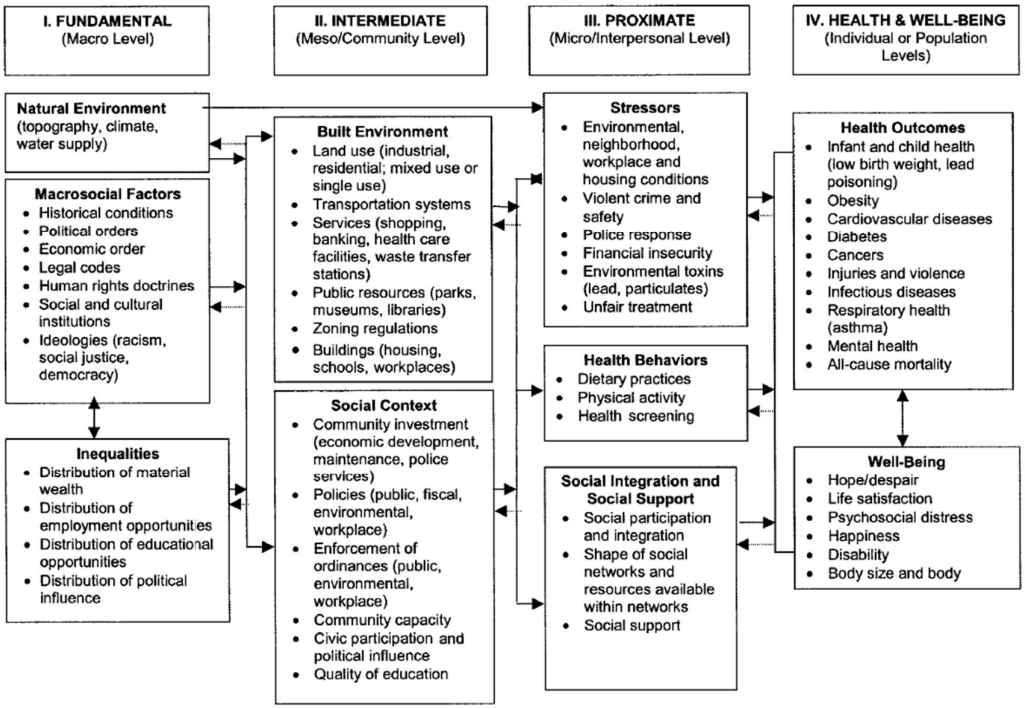
In the debate on urban health, there is a growing body of literature that draws implicitly on population health frameworks (Galea et al., 2005). Much of this literature has been motivated by the Healthy Cities Movement (explained in Box 2.1) to consider the social determinants of health in towns and cities and their implications for what is termed 'healthy city planning' (Hancock and Duhl 1986; Trevor Hancock 1993). This literature has included a number of frameworks that have sought to articulate features of the physical/built environment that affect health (Frumkin 2002; Northridge et al. 2003; Northridge and Sclar 2003; Schulz and Northridge 2004). While these frameworks have tended to focus primarily on the characteristics of urban areas that affect population health (the quality of the physical environment, strength and accountability of municipal governments, existence of civil society), they fall short on two fronts.

First, they fail to engage with urbanisation as a determinant of health in the sense that it contributes to the increasing share of the population in urban living environments (Galea et al. 2005; Vlahov et al. 2007; Kjellstrom and Mercado 2008). Contemporary urbanisation patterns are important because they require urban research, theory-building and practice to expand beyond a primary focus on Europe and North America toward the global South, where the majority of the world's urban population is now concentrated, where the majority of its future urban growth is expected to occur, and where a large and typically growing share of the urban population live in smaller urban centres (Satterthwaite 2016a), as discussed in Chapter Two (section 2.1.2). Understanding both the characteristics specific to smaller centres involving not only population size, but also population growth, density, social composition, institutional

capacity (the existence of local governments), occupational structure, and access to public facilities (hospitals) and services (water, sanitation and electricity) is of central interest here.

Second, conventional frameworks tend to focus on the characteristics of 'cities' independent of the characteristics of sub-populations that heighten their susceptibility to the health impacts of urban living. This gap is evident in the framework developed by Northridge et al. (2003) (Figure 3.3), which includes a variety of determinants at different scales, but does not address the way in which the 'social context' is configured by social relations around age, gender, ethnicity/race, religion, nationality and sexuality, among others.

Figure 3.3 : The social determinants of health in relation to the physical environment



Source: Northridge et al. (2003)

This gap can be attributed in part to the lack of engagement with gender studies in the debate on urban/public health (Frye et al. 2008). Gender is conceptualised as a "socially constructed set of relations, around which are built a set of cultural and institutional logics that influence expectations and norms about women's and men's different social roles, their entitlement to accessing and controlling a range of resources, and thus their different 'gender needs' or 'gender interests'" (Walker et al. 2013: 112, drawing on Moser 1993 and Molyneux 1995). Recent research has emphasised how gender intersects with other social relations and interacts with processes of urban change to produce and reproduce urban health risks between diverse women and men, boys and girls (Levy 2018), as discussed in Chapter Two (section 2.1.4).

Further insights come from intersectionality, a concept that emerged from critical feminism in the late 1980s to consider how people's multiple social identities interact with social positions and forms of systematic oppression to produce privilege and marginality (Nash 2008). According to Nash (2008), the concept serves several theoretical purposes: it subverts the gender binary by theorising multiple identities, enabling more sophisticated analyses of social relations and cultural norms that implicate overlapping identities; it provides a framework to address identity politics, thereby exposing intra-group differences through recognising how the diversity of women and men influences group politics; and addresses the exclusion of multiple individuals and groups that have been marginalised from theory and policy, exposing the experiences of those who have been excluded and the structural factors that underpin different forms of exclusion.

While intersectionality is an established theory in feminist research, it has been increasingly used by population health researchers to analyse the multiple drivers of social health inequalities (see Larson et al. 2016). Bauer (2014) identifies the ways in which intersectionality can contribute to population health research: it can enhance the documentation of health inequalities within intersectional groups and their underlying individual and societal causes; improve the validity of public health research by, for example, reducing measurement bias by considering which social variables are most important; produce data on the underlying causes of health outcomes for specific sub-populations; facilitate triangulation through mixed method approaches; and build theory on the social production of disease.

However, where disaggregated demographic health data are lacking, as in many smaller African urban centres, gender and intersectional frameworks can be difficult to operationalise. They nevertheless present valuable insight into the distribution of population health outcomes within and between particular groups based on social identity and status (age, gender, ethnicity, religion, ability/disability) and living environments. Understanding *who* people are, and *where* they live, is thus central to urban health.

3.1.2 Ecological lens

The rediscovery that urban health inequalities have become increasingly linked to the environment, and thus to the traditional realm of urban planning, as discussed in Chapter Two (section 2.1.5), has prompted growing interest in ecology—the study of human-environment interactions (Lawrence 1991; Songsore and McGranahan 1993; Glouberman et al. 2006; Rydin et al. 2012; Tozan and Ompad 2015). Whereas population health research has traditionally

focused on individual level risk factors (particular age and gender), ecological perspectives incorporate social, cultural, biological, demographic, environmental, institutional and historical factors at multiple nested scales (McLaren 2005).

In human geography and ecology, cities have been conceptualised as complex and dynamic socio-ecological and socio-technical systems characterised by mutual interactions between constituent parts, interdependence, feedback loops and constant flux (Berry 1964; Forester 1969; Mandelbaum 1985; Lawrence 1991; Grove and Burch 1997; Pickett et al. 1997; Piracha and Marcotullio 2003). This view has been adopted in the literature on urban health (Lawrence 1991; Glouberman et al. 2006; Rydin et al. 2012; Tozan and Ompad 2015), including the Healthy Cities Movement, with Hancock and Duhl (1988) describing cities as "the example par excellence of complex systems: emergent, far from equilibrium, requiring enormous energies to maintain themselves, displaying patterns of inequality and saturated flow systems that use capacity in what appear to be barely sustainable but paradoxically resilient networks".

More recently, urban health researchers (Rydin et al. 2012) have drawn on complexity thinking[5] to develop conceptual frameworks aimed at understanding how urban health outcomes are dependent on multiple determinants and scales, and how these outcomes can be improved through the role of urban planning in shaping the quality of the urban environment. Glouberman et al. (2006) define complex systems thus:

> "Complex adaptive systems are systems made up of many individual, self-organizing elements capable of responding to others and their environment. The entire system can be seen as a network of relationships and interactions, in which the whole is very much more than the sum of the parts. A change in any part of the system, even in a single element, can result in reactions and changes in associated elements and the environment. Therefore, the effects of any one intervention in the system cannot be predicted with complete accuracy because the system is always responding and adapting to changes and to the actions of individuals" (Glouberman et al. 2006: 829).

Glouberman et al. (2006) argue that traditional approaches to urban health have been too narrow and therefore not able to recognise its complexity. They identify three approaches, the second of which is of interest here. In this approach, researchers focused on environmental

[5] In ecology, complexity thinking emerged from a recognition that human environments are characterised by networks of interactions and relationships that are self-organising, non-linear, and chaotic and that occur at multiple spatial and temporal scales (see Allen and Starr 1982).

hazards unique to urban settings that impact health related to principally to sanitary conditions (water, liquid and solid waste, housing, overcrowding, air pollution) at the household and neighbourhood scales. Consequently, interventions were typically limited to the physical environment (ibid).

Glouberman et al. (2006) argue for a more holistic approach to urban health that recognises the interconnectedness of urban life and the interactions between people and their rapidly changing social and physical environments. They proposed the 'health in cities' approach to understand the characteristics of complex systems and their health impacts and implications. Its elements include:

- ***Self-organisation**:* Urban structures and functions are often formed outside formal institutions by individuals and communities faced with problems in their environment. These structures and functions are typically informal.
- ***Dynamic interactions**:* Towns and cities are neither linear nor static, but are constantly changing and adapting to change. Individuals and communities do not exist in isolation, but interact with their environments.
- ***Multiple viewpoints**:* Towns and cities can be described in various ways depending on different viewpoints (social, cultural, economic, environmental, political). Individuals may also adopt various roles, meaning they lead different lives and have different views.
- ***Emergent characteristics**:* Towns and cities are defined by more than their scale, including the phenomena produced by their scale (a small town may not yet have the same level of infrastructure as a larger urban centre). Influences on a town or city may therefore produce different effects.
- ***Critical nature of local conditions**:* The local context largely conditions the effects of planning interventions. Top-down, 'one-size-fits-all' planning approaches are bound to fail.
- ***Unpredictability of interventions**:* Towns and cities are interactive, dynamic and self-organising and are therefore constantly changing in unpredictable ways. Feedback loops in the system may result in stability or instability. Consequently, planning outcomes may be unpredictable.

Glouberman et al. (2006) argue that understanding urban health in complex systems requires a shift away from deterministic approaches focused on individual factors to a more interactive approach "that recognizes the importance of a broad range of influences on health" (ibid: 331). This approach involves more than just listing all known determinants, but also analysing the

complex interactions between them. Glouberman et al. identify several important implications of complexity thinking for urban research and practice:

- ***Gather local information**:* The critical importance of local context requires local information to inform interventions. Information must cover both the strengths and weaknesses of the system so that both can be addressed.
- ***Respect history**:* Complex systems are shaped by their past, and knowledge of their history is required to anticipate their future. This entails understanding the history of the people, communities and institutions involved in interventions.
- ***Consider interaction**:* Urban health is determined by more than individual biological characteristics; it is determined by interactions between individuals and communities and their social and physical environments.
- ***Promote variation**:* Various small-scale interventions that are tailored to local contexts offers a better opportunity of finding appropriate and effective solutions to problems in complex systems. Comprehensively planned interventions from the top-down are unlikely to succeed.
- ***Conduct selection**:* The variety of solutions produced by complex systems undergo a process of selection. Over time, this process will lead to the identification of increasingly effective solutions, but this depends on continuously monitoring and evaluating their performance and selecting the most effective ones.
- ***Fine-tune processes**:* The dynamic nature of complex systems requires interventions to be continuously refined through a process of selection. The process of intervening in complex systems is therefore iterative.
- ***Encourage self-organisation**:* Complex systems often produce solutions to problems without formal control or support. Such solutions have been developed by many community-based organisations in under-served areas where formal interventions are largely absent due to either neglect or marginalisation, for example, when unplanned settlements are viewed as 'illegal' and therefore denied services. This type of self-organising activity needs to be actively sought out and supported.

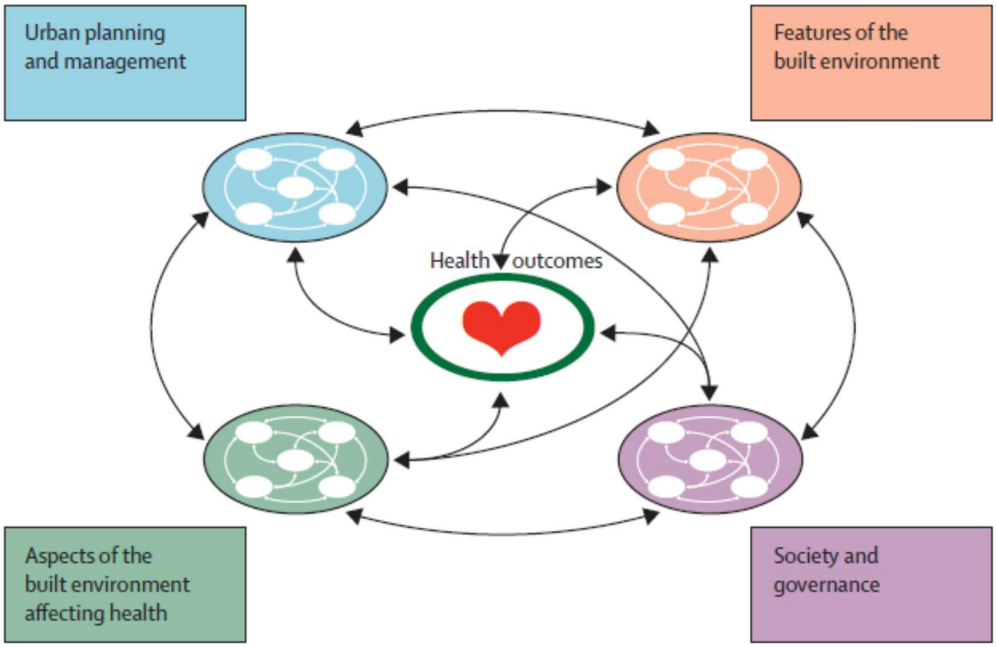
Smaller urban centres may be viewed as inherently less complex relative to their larger counterparts as a result of their tendency to have lesser populations, fewer stakeholders, simpler administrative frameworks, and environmental problems with smaller scales, as discussed in Chapter One (section 1.1.3). However, the complexity of small towns may be heightened by processes of in situ urban change that are transforming the urban social, physical and institutional environment, and by the presence of existing rural governance regimes that

may be resistant to such processes. The rapidity of in situ urban change may also mean that small town systems are not only complex, but also highly dynamic and thus difficult to predict, presenting major challenges for urban planning, as discussed below.

3.1.3 Institutional lens

Building on Glouberman et al. (2006), Rydin et al. (2012) proposed a framework for understanding urban health based on four mutually interacting factors: urban planning and management; features of the physical/built environment; society and governance; and features of the physical/built environment affecting health (Figure 3.4).

Figure 3.4: A framework for understanding urban health



Source: Rydin et al., (2012)

This framework marks an attempt to incorporate governance into urban health frameworks, but does not elaborate on the nature of governance in urban settings. Relevant planning perspectives come from Watson (2009) and Corburn (2009). As a Southern scholar, Watson (2009) emphasises a wider shift from urban government to governance in response to the multiplicity of stakeholders—of whom government is only one—now involved in urban planning and development (see also Stoker 1990; Montgomery et al. 2004; UN-Habitat 2009; Pierre 2011). UN-Habitat (2009) summarises the arguments for a new mode of urban governance in relation to several restructuring trends:

- A relative decline in the role of formal government in the management of social and economic relationships;
- The involvement of non-governmental actors in a range of state functions at a variety of spatial levels;
- A change from hierarchical forms of government structure to more flexible forms of partnership and networking;
- A shift from provision of formal government structures to sharing responsibilities and service provision between the state and civil society; and
- The devolution and decentralisation of formal governmental responsibilities to regional and local governments (UN-Habitat 2009: 73).

While these trends apply to some places more than others (e.g. decentralisation in sub-Saharan Africa is highly uneven (Resnick 2014)), it is argued that hierarchical forms of government institutions that emerged in the nineteen century—including those inherited in the colonial era—do not reflect the complexity of contemporary urban systems and their increasingly interconnected and contested nature (UN-Habitat 2009; Watson 2009). In this context, planning is now increasingly seen as a form of 'urban (or place) governance' embedded in power relations that influence the ability of different stakeholders to act (UN-Habitat 2009). Planning is thus viewed here as an activity frequently "… initiated by groups other than professional planners and governments (such as non-governmental and community-based organisations, and business), and the 'planning system' frequently incorporates these sectors in processes which are inevitably political" (Watson 2009: 154).

While the restructuring trends noted above have motivated growing interest in the changing role of urban/local government in urban planning and development, the focus has been primarily on Europe and North America, where the private sector has become an increasingly influential actor (Pierre 2011). Much less attention has been paid to the urban governance transformations occurring in the global South, despite some interest in large metropolitan regions (see Montgomery et al. 2004: 363), including those in Africa (Rakodi 1997). Consequently, the literature on the subject provides little guidance for researchers seeking to understand the nature of planning in urban governance systems outside the largest cities.

The interest here is in the literature that views urban governance as a form of urban politics, which Stone (2008) states "is a matter of understanding how a changing mix of forces is related to an evolving urban condition" (ibid: 185). Pierre (2011) argues that these forces are social and political in nature and combine to shape the prospects for collective action at the local level. The notion of collective action is useful in emphasising the conditions for it to emerge, which,

according to UN-Habitat (2009), vary in certain societies depending on the degree to which power is transparent and accountable.

Urban health researchers have recently adopted the concept of governance in the debate on healthy city planning. For instance, Burris et al. (2007) use the concept of 'healthy urban governance' to examine strategies for promoting urban health, but they do not explain the term. Corburn (2009) elaborates, arguing that; "healthy city planning must be viewed as healthy urban governance, where both the *substantive content* of what contributes to human well-being—the physical and social qualities that promote urban health—and the decision-making *processes and institutions* that shape the distributions of these qualities across places and populations are improved [emphasis in the original]" (ibid: 2).

Corburn's (2009) conceptualisation of urban planning as a form of governance departs from the traditional view of planning as a practice undertaken primarily by technocrats in value-free and apolitical decision-making environments (Watson 2009). Very little is known about urban governance in African towns beyond a small body of research that has apportioned a large share of the blame for planning failure to traditional leaders who continue to allocate land through customary channels in spite of formal plans and regulations (see Yeboah and Shaw 2013). This critique is not terribly helpful because it limits an understanding of planning failure to the behaviour of chiefs on the one hand, and the lack of formal institutional capacity on the other, as suggested in Ghana:

> "Further analysis of the state of affairs highlighted that the institutional arrangements for planning delivery is weak, and is often characterised by human resource shortages, funding inadequacies and logistical constraints, as well as ineffective legal frameworks for planning delivery. We argue that the growth of towns and cities in Ghana is hardly ever influenced by statutory or formal planning policy, because of the behaviour of some customary landholders and the weakness in the current institutional arrangement for planning delivery" (Yeboah and Shaw 2013: 21).

This critique is limiting because it reinforces a binary between customary and formal institutions that obscures the complex power dynamics that operate between them as they attempt to influence decision-making (see Nkurunziza 2008; Rakodi 2006). Here, the *practice movement* in urban planning (Liggett 1996) offers insight into the nature of planning practice in different urban governance contexts through observing the practices of planners, their interactions and their impacts through detailed case study research (Watson 2002). While the practice movement has traditionally sought to learn from the experiences of planners in professional

practice, it is expanded here to shed light on cases where planning practices are non-existent, socially illegitimate or highly informal, as in many African towns lacking strong, accountable and legitimate local governments. In this way, the practice movement provides an entry point for exploring the prospects for planning healthy environments in these centres through better understanding the urban politics that shape planning processes and subsequent planning outcomes.

3.2 Conclusion

This Chapter has introduced a new analytical framework to understand (a) how environmental health risks and outcomes are socially and spatially constructed and distributed in urbanising populations; (b) how the multiple determinants of environmental health across the full spectrum of hazards (everyday, small and large) interact at multiple nested scales (individual, household, neighbourhood, town-wide, national, international; and (c) how urban planning systems shape the quality of the urban environment and related health risks and outcomes in emergent African towns.

The novelty of this framework lies in its inter-disciplinary perspective, which draws together scholarship on gender and intersectionality, ecology, and urban governance. In doing so, it differentiates itself from other frameworks that focus on the determinants of health in linear and largely deterministic terms and without considering the importance of local context. The framework also differentiates itself by conceptualising small African towns as complex systems in order to understand the interactions between the multiple determinants of health in this context. This allowed the determinants in the social and institutional environments to be examined alongside those in the urban environment, thus implicating urban planning systems.

The framework's lenses are used to generate hypotheses, as presented in Chapter Eleven (section 11.3), so they can be tested in similar cases, positioning Karonga Town at the forefront of a nascent research agenda aimed at planning healthy environments in these settings. Rather than providing simplistic generalisations about small African towns, the aim is to develop in-depth empirical and theoretical insights from the case that may be of broader relevance. The framework's analytical lenses are intended to guide for future research to that end. The challenges and limitations of analytical generalisation are discussed in the following Chapter (section 4.3).

Chapter 4 Methodology

Urban health is defined most concisely as "the study of the health of urban populations" (Galea and Vlahov 2005: 1). While urban health can be traced back to the sanitary reform era (in the beginning, public health was essentially urban health), as discussed in Chapter Two (section 0), it has gained increasing scholarly and practical attention in the last two decades, particularly in response to urbanisation trends (Vlahov et al. 2007; Kjellstrom and Mercado 2008), as discussed in Chapter Two (section 2.1.5).

Galea and Vlahov (2005) identify three approaches to the study of urban health. The first compares population health in urban versus rural areas. Studies that have followed this approach have suggested that urban populations enjoy a 'health advantage' associated with the benefits of urban living, including access to basic services and public facilities, such as hospitals (Vlahov et al. 2005). This concept has been highly criticised for obscuring the 'urban penalty' typically experienced by poor people exposed to unhealthy environments, particularly in 'slums' (see Mitlin and Satterthwaite 2013). The second approach compares differences across cities usually in one or more countries, positioning city-level characteristics as key determinants of interest. Studies that have followed this approach have been criticised for limiting understanding of how urban characteristics impact the health of sub-populations (Galea and Schulz 2006). However, as shown in Chapter Two (section 2.1.2), this criticism does not recognise the degree to which differentials in service provision between urban centres of different sizes can influence differentials in urban population health. The third approach compares intra-urban differentials in population health linked to urban poverty and race/ethnicity at the neighbourhood level. This approach is emerging in Southern urban debates concerned with 'slum health' (for example, Lilford et al. 2017; Mitlin and Satterthwaite 2013; Unger and Riley 2007).

This study combines the second and third approaches to better understand the environmental health situation particular to Karonga Town at the intra-urban scale in relation to that of other urban centres of different sizes at the inter-urban scale. To recap, the research question and objectives are as follows:

- How is in situ urbanisation influencing the nature and scale of environmental health risks and outcomes in emerging African towns and their prospects for planning healthy urban environments?

- Objective 1: To test the hypothesis that smaller urban centres comprise a large and typically growing share of the urban population through an analysis of census data in Malawi
- Objective 2: To test the hypothesis that environmental health may be especially poor in smaller urban centres through an analysis of the 2010 Malawi Demographic and Health Survey (DHS)
- Objective 3: To document environmental health outcomes and their socio-spatial distribution in Karonga Town through an analysis of hospital records
- Objective 4: To understand the multiplicity of interacting determinants of environmental health in Karonga Town
- Objective 5: To understand the prospects for planning a health-risk free environment in Karonga Town through an analysis of the evolving institutional context in which its urban planning system is embedded

This Chapter outlines the methodology used to address the research question and objectives, beginning with the analytical model followed by the research approach, study design, study sites and study period, data collection and sample techniques, research partners and participants, data sources and analyses, data quality issues, limitations, and ethical issues.

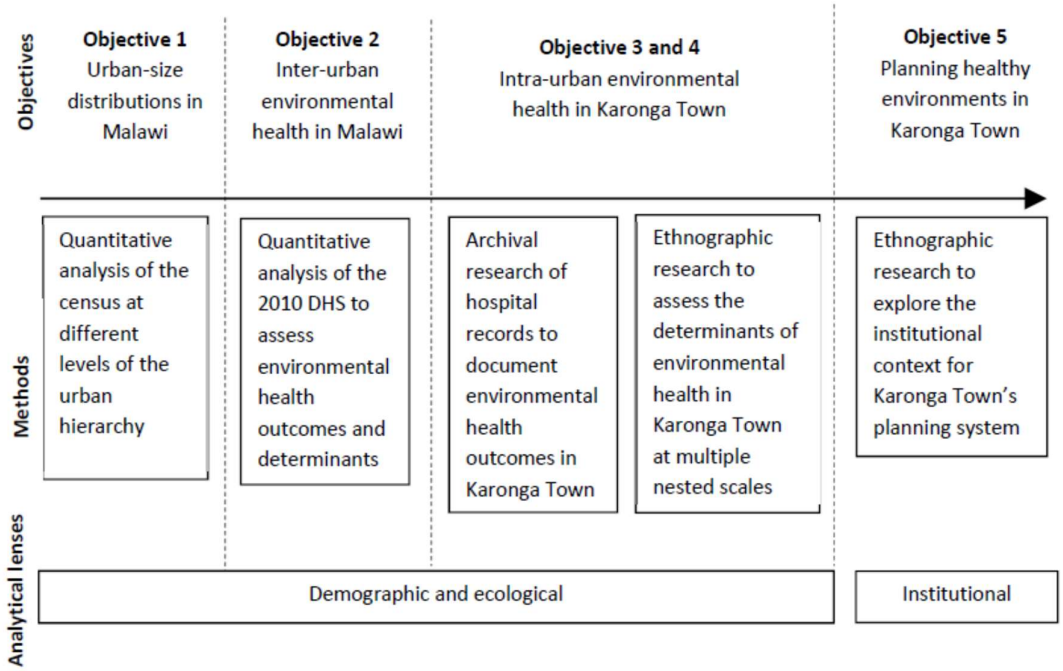
4.1 Analytical model

Figure 4.1 illustrates the analytical model that was used to address the research question and objectives. The first three objectives focus on the environmental health situation in smaller Malawian urban centres. The first objective seeks to establish the inter-urban distribution of the urban population living in urban centres of different sizes in order to assess the demographic importance of smaller urban centres. This objective is addressed through a quantitative analysis of the most recent 2008 Malawi census. The second objective seeks to explore the inter-urban distribution of environmental health and its determinants between urban centres of different sizes. This object is addressed through a quantitative analysis of the 2010 Malawi DHS.

Drilling down to the urban scale, objectives 3 and 4 seek to uncover the environmental health situation in Karonga Town. This involved documenting the prevalence of environmental health outcomes in its population through an analysis of hospital records, and exploring the determinants of these outcomes and their complex interactions at multiple scales through ethnographic research of local socio-economic, environmental and institutional conditions. The final objective seeks to understand the prospects for planning healthy environments in Karonga

Town through an ethnographic analysis of the town's planning system. The analytical lenses used to address each objective are specified at the bottom of Figure 4.1.

Figure 4.1: Methods used to address the research objectives



4.2 Research approach

The research embodied several approaches: applied; demand-led; collaborative; immersive; and reflexive. The research was applied in its focus on addressing a real-world problem: environmental health in African towns. The evidence is offered to better understand this problem and its implications for theory and practice in Malawi and other sub-Saharan African countries facing similar demographic, environmental and institutional challenges.

The research approach was demand-led in its focus on generating evidence that local stakeholders—physical planners, public health officials, community health workers, and community members and leaders—identified as important for their work. Local stakeholders were engaged throughout the course of the research, beginning with an initial site visit to Karonga Town over a ten-day period in August 2016. During the visit, meetings with local stakeholders were held to introduce the research, incorporate local perspectives on the nature of the problem and identify the type of information needed to respond. The research was refined between February and April 2017 while the project was awaiting ethics approval from the National Committee on Science and Technology (NCST). During this period, the research

proposal was presented to the Karonga District Health Management Team (DHMT), which is responsible for overseeing and coordinating public health services for the entirety of Karonga District. Because the Karonga District Hospital is located in the town, the DHMT recognised the need for health information that is disaggregated for the urban population (field notes, 2017).

To meet local demands for information, a collaborative approach was adopted through continuous engagement with local stakeholders. This involved close engagement with the Urban Africa Risk Knowledge (Urban ARK) local research partners, a group of community members supported by Mzuzu University to facilitate research projects and build local capacity, including their own (Figure 4.2). As residents themselves, the research counterparts possess a wealth of experiential knowledge of local conditions and actively participated in the design of the methodology, particularly the ethnographic research.

Figure 4.2: A group of Urban ARK local research partners

Photo credit: Wisdom Bwanali (2016)

The ethnographic research entailed an immersive approach that required me to live and work in the town under investigation over a seven-month period. This approach required self-reflexivity. As a white male from an English-speaking country (Canada), my frame of reference is influenced by internal biases based on my social identity and experience. To minimise these biases as much as possible, a conscious effort was made to consider the possibility of misinterpreting other peoples' meanings, experiences and understandings of the world around them. In doing so, I used an 'interpretive reflexivity' approach in order to continuously assess

"the social positions within ongoing circuits of communication between researcher and researched" (Lichterman 2015: 35). This approach was particularly useful when considering the place in which I lived in the town, how this focused my attention on differences in the quality of other peoples' living environments and how people perceived that quality themselves relative to my own observations and lived experiences. Employing a local research assistant, discussed below, helped me to operationalise this approach through constant communication. However, as a well-educated female from a different part of the country, the research assistant was not without her own biases. Both of us thus made an effort to self-reflect on our observations and interpretations and to validate them by communicating with those around us on a continuous basis.

Beyond methodological considerations, my social identity and status posed ethical dilemmas regarding the power imbalance between the 'researcher' and the 'researched' in a post-colonial context. This concern is influenced by the critical turn in geography dealing with the ethical aspects of doing ethnographic research in the global South, where geography's (and planning's) imperialist past has been, as Robinson (2003) puts it, "littered with the skeletons of murderous neglect and encounters" (ibid: 277).

Drawing together perspectives on researcher positionality from post-colonialism (Sidaway 1992; Madge 1993; Potter 1993) and critical feminism (Haraway 1988; Katz 1992), Griffiths (2015) emphasises the need for careful consideration of what it means to be a 'privileged western researcher' in post-colonial contexts, "where our contemporary privilege derives from and replicates, or may duplicate, colonial-era power relations between researchers and Southern Others" (ibid: 2). Discussions later in this Chapter highlight the importance of this consideration as I attempted to interact with people and establish relationships with them over the seven-months I lived in Karonga Town. During my time there, I was identified by many as a 'European', which I found unsettling as a Canadian-born citizen who did not identify as a European or, by extension, its colonial history. On one occasion, a colleague at Mzuzu University identified me as a European in the context of a discussion I cannot fully recall, which prompted me to clarify my identity as a Canadian. My colleague replied, rightly so, that Europeans also colonised North America, thus implicating me in colonialism.

In highlighting the power imbalance even between myself and fellow colleagues, the conversation re-affirmed the need for a self-reflexivity that "is always shaped by an acute awareness of geography's skeletons of empire and how we, as western geographers [and planners], might embody colonial histories in our travels South" (Griffiths 2015: 5). The ethics of positionality present significant challenges for 'post-colonialising' knowledge production in

geographic and planning debates historically dominated by western scholars, of whom I am part. A conscious effort was thus made to be self-reflexive of power imbalances based on my own identity and experience and those of 'others' in search of more equitable ethnographic exchanges.

4.3 Case study design

The case study approach is an empirical line of enquiry used to investigate social phenomena in their context (Yin 1994). In this sense, case studies are not methodologies in themselves, but involve different methods (qualitative and quantitative) (Blaikie 2010). The case study approach was used here to support Watson's (2002, 2003, 2016) call for a return to detailed case-based research in urban planning as a way of taking forward context-sensitive planning theory and practice (see also Flyvbjerg 2006), as discussed in Chapter Three (section 3.1).

To that end, the study design aims to identify new theoretical and practical insights from Karonga Town that can be developed in similar cases using the framework introduced in Chapter Three. Using case studies to build theory is an accepted strategy in urban research methodology (Robinson 2011, 2016), but needs to be qualified. On the one hand, their 'individualising' nature means that case studies are not always comparable, generalisable or amenable to theory-building. Many case studies have also been presented "without allowing them to engage either with one another or with more general or theoretical understandings of cities [and towns]" (Robinson 2011: 2).

On the other hand, case studies can provide detailed quantitative and qualitative insight into local contexts, processes and conditions that can be compared through the identification and testing of hypotheses across similar contexts, contributing to theory-building of broader potential relevance (Robinson 2011). This represents what Brenner (2001) identifies as an 'individualising' approach to case study research whereby the goal is to explain the conditions of one case or more through comparison with similar cases.

Some general conditions facing smaller urban centres are identifiable in the literature, suggesting that there is something *specific* about their character that can be *shared* across them: population growth (largely unplanned); weak local governance; strong rural-urban linkages; low connectivity with global economic systems; high levels of income poverty; risk accumulation cycles; and low levels of basic service provision (Hardoy et al. 2001; Hewett and Montgomery 2001; Satterthwaite and Tacoli 2003; UN-Habitat 2006; Dodman et al. 2009; Roberts 2011; Satterthwaite 2016a; Brown et al. 2017). While these conditions may apply to some smaller

African towns more than others, they support the argument that planning theory can be of broader applicability and that planning research can support analytical (as opposed to statistical) generalisation (Watson 2003, drawing on Yin 1994). Of interest here are the environmental and institutional conditions that may render the health of populations in smaller African towns at heightened risk based on the Malawian experience. Following Robinson (2011), the study identifies a series of hypotheses in Chapter Eleven (section 11.3) that can be tested in similar cases to determine the degree to which these conditions may be of wider empirical and theoretical relevance.

4.4 Study sites

Data were collected at the household, neighbourhood and urban scale in Karonga Town. During the seven months of field research, all 43 villages in the old town boundary, and some in the new town boundary, were visited. However, some methods (namely the semi-structured interviews) were undertaken in Mzuzu and Lilongwe where several key informants were based.

4.5 Study period

The study consisted of three periods. In the first period, the research proposal was developed between September 2015 and September 2016 and a preliminary site visit was conducted in August 2016, as discussed above. In the second period, the field work was undertaken in Karonga Town over a seven-month period between February and September 2017. In the third period, the findings were written-up between September 2017 and May 2018, although some Chapters were written in the field. The field work plan is presented in Annex IV.

4.6 Data collection and sample techniques

The study used a mixed method approach. Traditionally, quantitative researchers in the positivist tradition have questioned the scientific validity of qualitative methods since their findings are deemed to be neither objective nor generalisable to larger populations (Danermark et al. 2001; Blaikie 2010). For traditional positivists, qualitative methods are imprecise, influenced by subjective opinion and thus incapable of drawing conclusions or predicting associations (Danermark et al. 2001).

For qualitative researchers, quantitative methods are based on a faulty notion of objectivity and cannot explain either the complexity of social reality or the lived experiences of people and the different meanings they attach to the world (Danermark et al. 2001). This critique is evident in

health research, traditionally dominated by positivism, whereby "the detailed scientist examines parts isolated from their context and searchers for universal laws" (Alderson 1998: 1008). Similar critiques are evident in urban health. Corburn (2009) warns that the exclusive use of quantitative methods risks over emphasising statistical associations between environmental conditions and health, potentially over-emphasising physical factors at the expense of others.

However, dichotomous views of quantitative and qualitative research are counter-productive. Researchers are increasingly realising the analytical utility of mixing methods in the social sciences (Blaikie 2010; Danermark et al. 2001) as well as urban/public health (Galea and Vlahov 2006; Kaur 2016). This study used a mixed methods approach to combine a quantitative perspective on the prevalence of environmental health problems according to the characteristics of particular people and places (what, where and who) and a qualitative perspective on the underlying causes of these problems and their socio-spatial distribution according to people's perspectives, contexts and socio-cultural influences (why and how). The assumption implicit in this approach is that environmental health problems cannot be understood independent of social reality. The following mix of methods was used to address the research objectives in the order in which they are presented. The process was guided by the analytical model outlined above.

4.6.1 Quantitative analysis of the Malawi census

The census is the primary source of demographic information on population dynamics and characteristics at the national level. As a national sample survey, its data are statistically representative of the national population and are frequently used by the United Nations (UN) (UNDESA 2015) to estimate population trends, including urban population growth rates, urbanisation levels and rates, and urban size distributions at different scales (typically municipal, district, regional and national) (Satterthwaite, 2007). In Malawi, the National Statistical Office (NSO) is responsible for conducting censuses on a decennial basis. The last census was conducted in 2008 (NSO 2008).

Census data were collected from available NSO statistical reports. Data tables in these reports are seldom disaggregated beyond the four largest cities (Lilongwe, Blantyre, Mzuzu and Zomba) and 'other cities', categorised as secondary centres and rural market centres (both undefined). These reports have been criticised for obscuring the urban size dimension of urbanisation and for reinforcing a predominate focus on the four largest cities (Manda 2013).

In response to calls for more detailed census data, the NSO (n.d.) released a report containing datasets disaggregated for a range of urban centres of different sizes, including 27 rural market centres with populations less than 18,000. Due to the inclusion of rural market centres, it was possible to disaggregate the urban population by a broader range of urban centres of different sizes as a basis for re-assessing urban size distributions. In relying on census reports, the study builds on recent efforts by Satterthwaite (2016a) to determine the share of the urban population living in smaller urban centres using similar sources. This method addressed the first research objective. The implications of the findings for informing the processing and presentation of the 2018 census are outlined in Chapter Eleven (section 11.4).

Sampling technique

Manda (2013) proposed a new four tier hierarchy to estimate the share of the urban population of different sizes. Manda's report motivated the NSO (n.d.) to release more detailed census data. The analysis thus used the proposed hierarchy as a sample framework to analyse the distribution of thee urban population by population size using these data (Table 4.1). The hierarchy defines urban centres as those with more than 5,000 inhabitants, the threshold distinguishing urban from rural centres.

Table 4.1: Proposed settlement hierarchy for Malawi

Tier	Category	Population size	Number	Examples
1	Primary centres	> 100,000	4	Lilongwe, Blantyre, Mzuzu, Zomba
2	Secondary Towns	50-99,999	Unknown	Karonga Town, Kasungu, Salima, Liwonde, Dedza, etc.
3	Intermediate Towns	20-49,999	Unknown	Various district and market centres, such as Chitipa, Kasoba
4	Small towns	5,000-19,999	Unknown	Jenda, Malomo, etc.

Source: Manda (2013)

Limitations

The analysis of the census data has three limitations. First, the 2008 census data are outdated and therefore do not accurately represent current urbanisation patterns and trends. Unfortunately, data from the 2018 census were not available at the time of the study. Second, census reports do not provide statistics for individual urban centres other than the four largest cities. Nor do the reports specify clear definitional criteria for urban centres. Consequently, it is unclear whether current statistics are representative of all urban centres. This limitation was

overcome by drawing on census data recently released by the NSO for settlements beyond the four largest cities, including rural market centres.

4.6.2 Quantitative analysis of the 2010 Malawi DHS

The DHS is a nationally representative household questionnaire created by the United States Agency for International Development (USAID) to collect household demographic and health information on, for example, maternal and child health, reproductive health, nutrition, child survival and mortality, fertility, immunisation, household characteristics and environmental conditions (Rustein and Rojas 2006). To facilitate international comparison, the indicators in the survey are standardised. The DHS programme has five main objectives:

- To provide decision-makers in participating countries with information and analyses useful for informed policy decisions;
- To improve coordination and partnerships in data collection at the international and country levels;
- To develop the skills and resources necessary to conduct high quality demographic and health surveys in participating countries;
- To improve data collection and analysis tools and methodology; and
- To improve the dissemination and utilisation of data (Rustein and Rojas 2006: 1).

More than 130 DHS household surveys have been completed in more than 70 countries, most of which receive development assistance from USAID (Rustein and Rojas 2006). The first surveys in Malawi were conducted by the NSO in 1992 and 2000, both of which captured information at the regional and national levels (NSO n.d.). The 2004 DHS captured more detailed information at the sub-regional level, but was limited to selected districts, achieving a sample of over 10,000 urban and rural households (ibid). The 2010 DHS provides the most detailed information to date, covering all of Malawi's 28 districts (NSO and ICF Macro 2011). While the 2015-16 DHS has recently been released, it only became available after data analysis was completed. The 2010 DHS nevertheless corresponds more closely with the timing of the 2008 census. Due to lag times in publishing census reports, it is not known when the 2018 census will become available.

Table 4.2 outlines the indicators that were used to analyse environmental health outcomes and their determinants between urban centres of different sizes. The indicators were selected based on a detailed report by the World Health Organization (WHO) (Prüss-Üstün and Corvalan 2006) and discussions with the Karonga DHMT. The analysis has two objectives: (a) to compare the spatial distribution of environmental health problems and their determinants among children

under the age of 5 years between urban centres of different sizes and locations; and (b) to compare the proportion of the population in each urban size category suffering from environmental health problems. Infants were selected due to their heightened susceptibility to environmental diseases (see Hardoy et al., 2001). This method addressed the second research objective.

Table 4.2: Indicators for environmental health and its determinants

Environmental health determinants	Environmental health outcomes
• Access to piped water in the home • Access to flush toilets • Access to electricity	• Diarrhoea • Under-five mortality rates

Informed by Prüss-Üstün and Corvalan (2006)

Sample technique

The sample was based on the four tier settlement hierarchy that was used to re-assess the share of the urban population living in urban centres of different sizes. The urban centres that met the criteria to be included in the hierarchy served as the sample framework for the analysis. The sampling procedure is detailed in Chapter Six (section **Error! Reference source not found.**).

Limitations

The analysis of the 2010 DHS had three limitations. First, because the analysis used a different definition of urban areas than that used by the NSO, the sample framework includes urban centres that the DHS either categorised as rural or did not sample. Consequently, clusters in and around those urban centres were sampled manually, but due to the geographic offsets used to protect the confidentiality of household respondents, it is possible that many clusters were misclassified as urban when they came from outlying rural areas. Second, many urban centres that were sampled contained a small number of clusters and are therefore less well represented than others, highlighting the limitations of relying on a national sample survey for sub-national analysis. Third, the indicators for access to piped water to the home, flush toilets and electricity do not consider whether access to them is necessarily safe. Consequently, the indicators assume they are environmental determinants when they may not be entirely. Similarly, the indicators for environmental health outcomes, such as diarrhoea, assume they are causally linked to environmental determinants when they may be influenced by other determinants.

4.6.3 Archival research of inpatient records at Karonga District Hospital

While hospital records are typically used for clinical purposes, they hold significant potential to reveal the causes of disease in populations and sub-populations both cross-sectionally and longitudinally (Casey et al. 2016). The Karonga District Hospital keeps individual patient records in each of its inpatient and outpatient wards:

Inpatient Wards

- Paediatric
- Maternity
- Female
- Male

Outpatient wards

- Five and under
- General (age 13 and above)
- X ray
- Surgical
- Medical
- Laboratory
- Orthopaedic
- Eye
- Dental
- Maternal child health
- Postnatal
- Anti-Retroviral Treatment (ARV) (field notes, 2017)

Records for urban inpatients were collected from the admission and discharge registers of the paediatric, female and male wards at Karonga District Hospital under the Ministry of Health because they included a specific variable for the home village in which inpatients reside. The maternity ward was excluded because it used a different record keeping system that did not specify the home village. (Notwithstanding, environmental causes are difficult to detect in maternal health conditions) (Prüss-Üstün and Corvalán 2006).

Outpatient records were also excluded since they are stored on computers located in the wards and are frequently used by technicians. It would have been disruptive to use the computers for

extended periods of time as a result. The inpatient wards had hardcopy registers that could be temporarily removed from the wards with minimal disruption (Figure 4.3).

Figure 4.3: Blank register used by inpatient wards

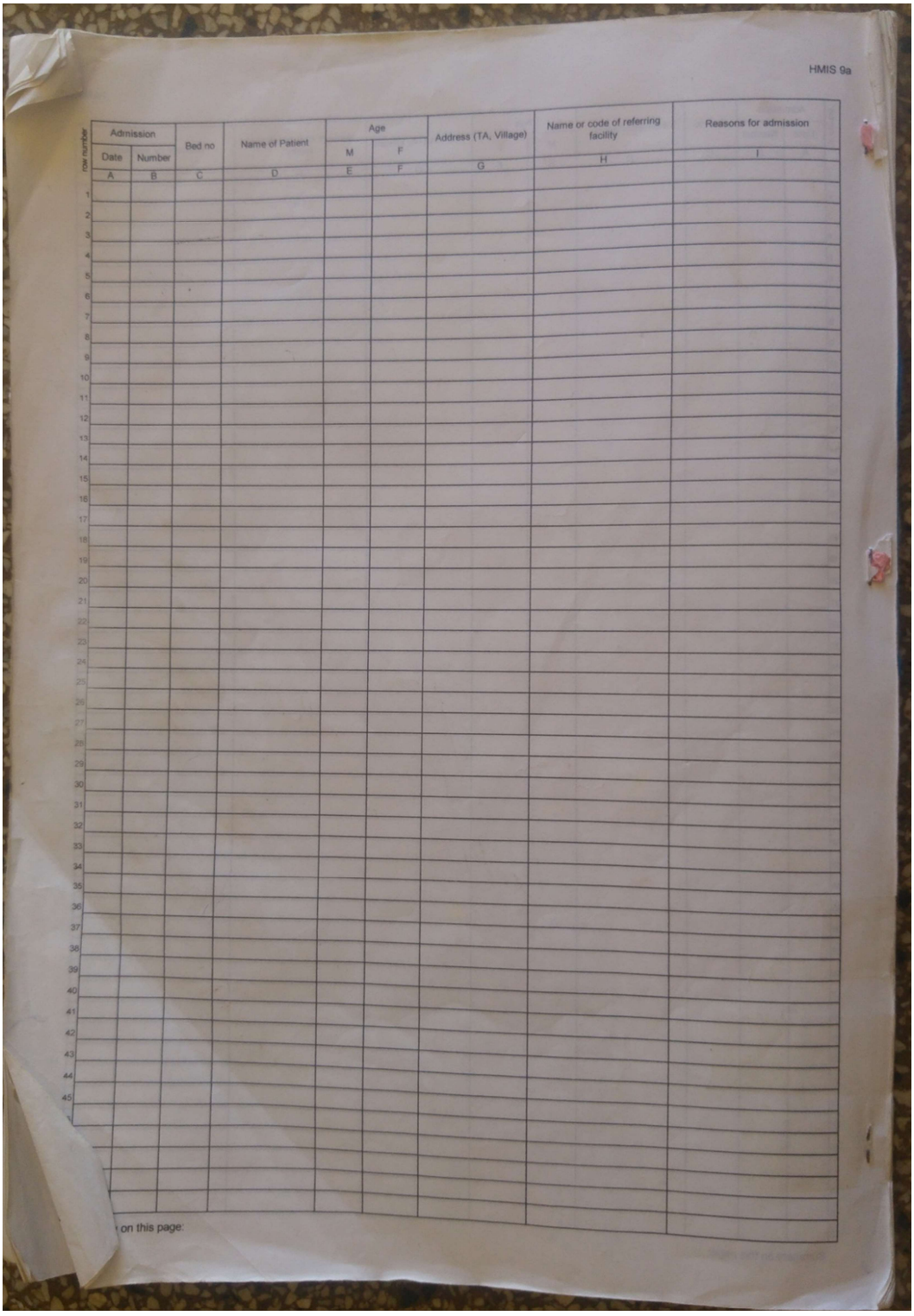


Photo credit: Author (2017), with the permission of the Karonga District Hospital

The inpatient records were analysed using a matrix developed to categorise diseases and health conditions with known environmental contributions (environmental health problems) (Table 4.3). The matrix was developed based on a comprehensive report by the WHO (Prüss-Üstün and Corvalan 2006), as reviewed in Chapter Two (section 0.4), and discussions with the Karonga DHMT. Two criteria from the report were used:

- Diseases and health conditions must have known environmental contributions; and
- Diseases and health conditions with environmental contributions must be related to environmental factors that can be reasonably modified through physical interventions.

This method addressed the third research objective.

Table 4.3: Environmental health matrix

Group 1	**Group 2**		**Group 3**
Infectious and parasitic diseases	*Nutritional disorders*	*NCDs*	*Unintentional accidents/ incidents*
Respiratory infections • Upper respiratory tract infections • Lower respiratory tract infections (Pneumonia, Bronchitis, Tuberculosis) Diarrhoeal diseases • Cholera • Dysentery • Gastroenteritis Intestinal nematode infections • Ascariasis • Trichuriasis • Hookworm Other • Malaria • Typhoid fever • Ebola • Trachoma • Schistosomiasis • Hepatitis B/C • Dengue • Onchocerciasis • Lymphatic Filariasis • Leishmaniasis	• Malnutrition • Anaemia	Cardiovascular diseases • Ischaemic heart disease Cancers • Lung cancer Respiratory diseases • Asthma • Chronic Obstruction Pulmonary Disease (COPD) Other • Anorectal atresia • Cleft lip or palate • Oesophageal atresia • Heart anomalies • Spina bifida • Down's syndrome • Cataracts • Deafness	• Road traffic accidents • Drownings • Falls • Burns • Snake bite • Scorpion bite • Animal bite • Fractures • Sprains • Electric shock • Head injury • Wounds Poisonings • Chemical • Organophosphate • Plant poisoning

Informed by Prüss-Üstün and Corvalan (2006) in consultation with the Karonga DHMT

Sampling technique

The sampling procedure for the inpatient registers entailed four stages. First, a sample framework was developed by compiling a list of all villages located in Karonga Town. The list was used to purposively sample urban inpatients from the paediatric, female and male wards (for a list of these villages, see Annex I). Incomplete and illegible hospital records were excluded. Sample errors are discussed in Chapter Seven (section 7.3).

Second, the sample was stratified by categorising the villages into the old and new town boundaries (the boundary was extended in the 2013 Urban Structure Plan to incorporate peri-urban areas) (Ministry of Lands and Housing 2013). Third, inpatient records from the female, male and paediatric wards were collected for the a 12-month period between 1 August 2016 and 31 July 2017. Since data collection began in April 2017, the records from 1 August 2016 onward were collected retrospectively. Records for the remaining months were collected at the beginning of each. The information recorded included: age and gender; reason for admission (ailment); and name of home village. Fourth, mortality burdens in the urban inpatient population were recorded from the discharge registers of each ward.

Limitations

The analysis of the hospital records had three limitations. First, the use of inpatient records may over-represent more serious illnesses and injuries that require hospitalisation and under-represent people who do not go to hospital when sick or injured for socio-economic, cultural or mobility reasons. Consequently, the inpatient records may not be entirely representative of the town's population. However, because Karonga is a small town, it is more likely that almost everyone with a serious condition will seek treatment at the hospital, although those who died along the way were necessarily excluded. Second, the inpatient records are kept in hard copy format and thus contain numerous sample errors related to faulty and inconsistent record keeping practices, thereby reducing the representativeness of the sample. Third, HIV/AIDS is an underlying health condition for many people, but was not consistently recorded. Consequently, it unclear whether causes of morbidity and mortality among people who may have had HIV/AIDS were related primarily to environmental factors or immune deficiency.

4.6.4 Ethnography

Ethnographers explore social reality as it exists in a particular context (O'Reilly 2012). Data are drawn principally from fieldwork, wherein the investigator enters the social world of the people and place under study as an observer or participant over an extended period (ibid).

During my seven months in Karonga Town, I lived in Bwiba, a village just east of the town centre near the hospital. Before arriving, I asked a friend to help me find a modest house located in a typical neighbourhood somewhere near the town centre. Instead, he found me a sprawling bungalow in a planned low-density area, where most of the town's wealthiest residents reside (Figure 4.4). His rationale was that I would be "less visible" and thus less likely to be bothered by "curious" neighbours there. While I appreciated his efforts and thanked him very much, I was concerned that living in a five-bedroom house with piped water, electricity connections and two flush toilets connected to a septic tank (under which lived a scarily large lizard) would not only disconnect me from the realities of people, most of whom reside in traditional/non-statutory settlements, but also conform to my social identity as an ex-patriate Caucasian male professional. People who share similar identities are expected to live in such areas, and I resented reinforcing this popular perception.

Figure 4.4: My (excessively large) home in Karonga Town, Bwiba village

Photo credit: Author (2017)

My experience living in Bwiba nevertheless afforded a valuable perspective on the nature of socio-spatial inequalities regarding housing and living conditions. These inequalities were a

source of constant reflection for me as I walked and rode my bicycle throughout the town. For this reason, I am glad I lived in Bwiba, and would not have changed a thing.

Informal observations and discussions

Informal observations and discussions with people from all walks of life provided a continuously deepening understanding of the case. This method involved casually observing the everyday practices and activities of people in their daily lives and engaging in spontaneous conversations as opportunities arose. This method entailed the collection of experiential data through social immersion, whereby the researcher lived in the place under study and participated in everyday life.

Frequent power cuts, particularly during the dry season (most electricity in Karonga Town is hydroelectric), created moments to explore different parts of the town when computers ran out of batteries. My research assistant and I would "do ethnography" when the lights cut, venturing out from our office in the town centre to explore our curiosities. Consulting satellite images and following our interests, we set out to visit different residential and commercial areas to interact with people, observe their environments and generally 'hang out'. Due to the town's relatively small spatial area, aside from the more remote peri-urban areas, most villages were accessible by walking and cycling (Figure 4.5). By the end of the field work, all villages in the old town boundary and several in the new town boundary were visited. Observations were recorded in personal notebooks and are cited as 'field notes' throughout the thesis. Because many of my observations were informal and may not have appeared as important until later on, many were not formally recorded, which would not have been practical given the spontaneous nature of ethnographic research.

Figure 4.5: My bicycle ('njinga')

Photo credit: Khumbo Kumwenda (2017)

Sampling technique for the informal observations and discussions

A combination of purposive and haphazard methods were used to spontaneously observe local people and engage them in conversation. Due to the casual nature of this method, a sample size was difficult to determine and not entirely necessary to specify. Observations were recorded in a note book that I carried with me at all times.

Pictorial documentation

Photographs were taken of local environmental conditions while walking and cycling throughout the town. The thesis includes numerous photos, particularly throughout Chapter Nine, providing a first-hand glimpse into the environmental health situation on the ground.

Sampling technique for pictorial documentation

Haphazard sampling techniques were used in order to remain flexible and responsive to changing environments and scenes. Purposive techniques were used when I was referred to particular places.

Follow Along Participant Observation (FAPO)

FAPO is a qualitative method developed by McFarlane and Silver (2017) to observe the everyday experiences and practices of local actors as they navigate urban life. This method was used to observe the Health Surveillance Assistants (HSAs) as they delivered health services, monitored local environmental conditions (sanitation, water source protection, and water treatment), and conducted disease surveillance in communities. HSAs perform various functions, including:

1. Serving as a link between fixed District Health Services and the community, working directly with village/community leaders and other volunteers in providing environmental and personal health services in collaboration with Medical Assistants, and Assistant Environmental Health Officers.
2. Conducting community assessments and village inspections, monitoring growth and reporting disease epidemics.
3. Participating in providing immunisation, maintaining equipment and improving the quality of water by protecting shallow wells and chlorinating untreated water.
4. Treating minor ailments and facilitating the formation and training of Village Health Committees (VHCs) and volunteers.
5. Supervising VCHs and volunteers and referring the ill to the nearest health unit.
6. Recording data in relevant registers and instruments using Health Management Information System (HMIS) guidelines, and disseminating information to VHCs.
7. Reporting to designated Area Supervisors.
8. Preparing monthly work plans.
9. Providing feedback to the community.
10. Performing other duties deemed reasonable for the post (field notes, 2017).

HSAs were followed to provide detailed qualitative insight into environmental health problems at the household and village scales and into the delivery of local health care services. This method addressed research objectives 3-5.

Sampling technique for FAPO

Seven HSAs were selected by the Senior District Environmental Health Officer (DEHO) to cover each of the town's three Village Development Committees (VDCs): Mwahimba; Mweniyumba; and Katolola. Each HSA was followed for a half day period (Table 4.4). Observations were recorded in personal note books.

Table 4.4: Sample of HSAs and the villages they serve

HSAs	VDC level	Village headmen level
HSA 1	Mweniyumba	Myanyongo, Mwambetania
HSA 2	Katolola	Malema 2
HSA 3	Mwahimba	Mwawembe
HSA 4	Katolola	Mwambuli 2
HSA 5	Katolola	Luhimbo 2
HSA 6	Mwahimba	Mwahimba and Mwamatope
HSA 7	Mwahimba	Mwanyesha

Semi-structured interviews

Semi-structured interviews with key informants were undertaken by myself and my research assistant to understand how different stakeholders participate in urban planning and decision-making processes and their underlying interests, motivations and rationalities, and to understand the governance structure for urban planning and public health in Karonga Town. The guides that were initially intended to be used for the interviews are provided in Annex V, although they were not used in favour of a more strategic approach that enabled targeted issues to be explored with key informants.

Sample technique for the semi-structured interviews

A total of 17 key informants, including government officials, chiefs, practitioners from non-governmental organisations (NGOs) and university faculty (see Annex VI), were sampled using a combination of purposive and snowball techniques. The sample was determined based on informal discussions, local news reports and empirical studies. Due to their formal nature, the interviews did not yield in-depth insight. The political sensitivities surrounding recent planning decisions and development projects made some officials uneasy about expressing their views while being audio recorded. Many informants felt more comfortable expressing their viewpoints outside their official capacities during informal discussions, which far outnumber the interviews. Ethical issues concerning informed consent are discussed below. All interviews were recorded and transcribed by my research assistant.

Secondary data analysis

Various secondary data sources—ranging from empirical studies to census data to statistical and policy reports—were analysed to ground the investigation in an understanding of the local context, draw on the perspectives of other researchers, and enable a more nuanced analysis of the primary data. In particular, a representative town-wide questionnaire survey by Manda and Wanda (2017) was used to understand access to basic services (water, sanitation and electricity).

Another study by Manda et al. (forthcoming) was also drawn on to understand the environmental determinants of disease outbreaks (cholera) in certain villages. Most secondary data are presented in Chapters Five and Nine.

Previous evaluations of the urban situation in Malawi (Potts 1985a; Kalipeni 1997; Manda 2013) were drawn on to contextualise the analysis of census data in Chapter Six. While the census, the DHS and the hospital records are secondary sources, they were separated above in order to explain their methodology in more detail.

Sampling techniques for secondary data analysis

Secondary data was sampled based on an ongoing review of literature available on the internet and collected in digital and hardcopy format during the field research.

Limitations

The ethnographic analysis had two main limitations. Firstly, my social identity and status as a well-educated, white male may have coloured my observations and thus misrepresented the realities of local people. My interpretations and observations were validated through continuous and conscious engagement with people who I was observing and interacting with daily. Second, it was my initial intention to spend 12 months in Karonga Town so as to observe seasonal changes that influence environmental health risks, but due to time constraints, my time in the field was limited to seven months. Consequently, my observations may not represent the changing nature of environmental health risks at different times of the year.

4.7 Research partners and participants

The main research partners included those engaged in Urban ARK in the United Kingdom, particularly the Bartlett Development Planning Unit (DPU) and in Malawi, particularly the Department of Land Management at Mzuzu University. I have been working closely with Mzuzu University since I was an Assistant Lecturer at the Department of Land Management in 2010 and 2011.

A research assistant, Ms. Khumbo Kumwenda, was employed between March and August 2017. Ms. Kumwenda is a former student in the Physical Planning stream at the Department of Land Management and was referred by Mr. Mtafu A.Z. Manda, Senior Lecturer at the Department. Other research participants included:

- Local residents for the informal observations and discussions;

- HSAs for FAPO;
- Community members and leaders, government officials and politicians, NGO practitioners, and private actors for the semi-structured interviews (see Annex VI); and
- The Karonga DHMT, clinicians, nurses and data managers from the Karonga District Hospital for the archival research.

4.8 Data sources and analysis

The use of multiple data sources allows the investigator to collect pieces of the 'puzzle', with each contributing to a deepening understanding of the case study as a whole (Baxter and Jack 2008). The different data types and sources analysed are outlined in Table 4.5.

Table 4.5: Data types and sources used for each method

Ethnography				**Archival research**	**Quantitative analysis**
Informal observations and discussions	*FAPO*	*Semi-structured interviews*	*Secondary analysis*	--	--
Notes and pictures (qualitative)	Notes and pictures (qualitative)	Notes and transcripts (qualitative)	Quantitative and qualitative studies on Karonga Town's environment (Manda 2013; Manda 2014; Manda et al., 2016; Manda and Wanda 2017) Quantitative and qualitative studies of urbanisation trends in Malawi (Kalipeni 1997; Manda 2013; Potts 1985a, 1985b) Policy documents and plans (Ministry of Lands and Housing 2013)	Hospital inpatient records (quantified qualitative data)	The Malawi census (1987-2008) (NSO 2008, 2, n.d.) The Malawi Integrated Household Survey (NSO 2012) The 2010 Malawi DHS (NSO and ICF Macro 2011)

Census data were analysed quantitatively by estimating the share of the urban population living in settlements of different sizes using the four tier settlement hierarchy proposed by Manda (2013). These estimates were used as the sample framework for the 2010 Malawi DHS, which was analysed by cross-tabulating the indicators for environmental health outcomes and their determinants at different levels of the urban hierarchy.

Qualitative data from the inpatient registers were entered as categorical codes and then analysed quantitatively. Morbidity and mortality burdens for different environmental health problems were then compared socially (between age and gender) and spatially (between different villages) through cross tabulation and frequency tables. All data were analysed using descriptive statistics.

Qualitative data from the informal observations and discussions, FAPO and semi-structured interviews were recorded textually (through note-taking and transcription). In the case of the FAPO, photographs of local environmental conditions and interventions were taken. The data were analysed by iteratively mapping the connections between key words and naming and grouping key themes in order to identify emerging patterns.

4.9 Data quality issues

The advantages and disadvantages associated with the data collected are summarised in Table 4.6. Many data quality issues were addressed through triangulating different data types and sources. For example, FAPO augmented the archival research of hospital records by observing the local social and physical environment in which environmental health problems emerge outside the hospital; primary data (experiential data, pictorial data, hospital records) were combined with secondary data (census data, local studies, the DHS) to deepen the analysis and incorporate the perspectives of other researchers; and the informal observations and discussions validated observations from the semi-structured interviews that may not have captured sensitive information.

Table 4.6: Data advantages and disadvantages

Quantitative analysis of the Malawi Census	
Advantages	• Strong statistical power due to breadth, consistency and comparability • Data for small areas may be available due to coverage
Disadvantages	• Census data were drawn from statistical reports that may not include all urban centres. The possible omission of some urban centres may have skewed the estimates
Quantitative analysis of the 2010 DHS	
Advantages	• Strong statistical power due to breadth, consistency and comparability • The DHS uses a multi-stage sample that selects households from geographic sampling units in the form of districts (urban and rural). The sample enables analyses of individual, household and population-level indicators on the social

	and to a lesser extent spatial distribution of health determinants and outcomes. • Recent addition of GPS data enables population health questions to be addressed using spatial analysis • The sample may not be inclusive of all urban centres in Malawi because it relied on census data collected from census reports rather than from the raw census data
Disadvantages	• Random displacement of clusters creates spatial uncertainty and positional errors that can result in statistical bias (whereby the method of delineating the clusters skews the results • The DHS does not provide spatial data that is detailed enough to identify urban centres by their names, sizes and locations, making it difficult to analyse the urban size dimension of environmental health • Indicator estimates were not entirely accurate at the sub-national scale since the sample is nationally representative • The DHS is nationally representative and is therefore not locally represented. Consequently, sample sizes tend to become increasingly haphazard at the lower end of the urban hierarchy. • These limitations thereby limit the accuracy of the indicator estimates
Archival research of inpatient records	
Advantages	• Population-based • Captures disease-specific data • Karonga District Hospital is located in the town and may more closely represent the morbidity and mortality burden in the population
Disadvantages	• Health outcomes difficult to attribute to underlying causes • Sample errors were created by inpatient records that were missing information (home village, health condition, age, sex) • Limited information on social characteristics (beyond age and sex) and local environmental conditions (beyond name of home village) • Biased toward those who go to hospital, excludes those who do not tend to go to hospital • May over-represent more serious morbidities and mortalities • May under-represent more minor morbidities and mortalities • Misclassification errors likely occurred in cases where an inpatient had more than one illness, making it difficult to determine the main cause of death

Ethnography	
Informal observations and discussions	
Advantages	• Provided in-depth understanding of the social and physical context through everyday lived experience • Enabled observations of environmental hazards that may not be observable during a shorter time period
Disadvantages	• Observations may have been preconditioned by researcher's preconceived notions • Observations of local practices and behaviours may have been influenced by researcher's identity as an outsider
FAPO	
Advantages	• Yielded first-hand qualitative insight into health prevention and promotion activities at community level, user experience and health care seeking behaviour • Yielded understanding of work that may be missed by traditional observations and interviews • Validated findings of the other ethnographic methods
Disadvantages	• Information provides snapshot of situation, but not change over time • Insights are not inclusive or representative of all target groups
Semi-structured interviews	
Advantages	• Collected large amounts of detailed information on experiences, perceptions, attitudes, values, beliefs and motives • Relatively flexible method allowing informants to express their own views freely • Comparable and reliable (if questions are standardised) • Interviewing different actors verified the veracity of other responses
Disadvantages	• Data may have been influenced by the researcher's social identity and positionality • Findings could be invalid if the researcher has no way to independently verify whether the informant is truthful or unbiased
Secondary data analysis	
Advantages	• Combination of multiple secondary data sources provided a more detailed and more comprehensive picture of local circumstances • Grounded study in current debates and provided a background context
Disadvantages	• Different datasets were not available all for the same year, limiting their comparability • Census data could have been biased toward formal settlements if unplanned settlements were under-represented

- Data from surveys of Karonga Town used the old town boundary; data for the new town boundary was not available

4.10 Ethical issues

The study was granted ethics approval from the Chair of the University College London Research Ethics Committee on 24 November 2016 and from the NCST in Malawi on 29 March 2017. Ethical issues specific to each method are outlined below.

4.10.1 Quantitative analysis of the Malawi census

- *Confidentiality and anonymity:* The NSO does not collect identifying information for household members or households. The NSO consults the National Statisticians Data Ethics Advisory Committee on ethical issues.

4.10.2 Quantitative analysis of the 2010 Malawi DHS

- *Confidentiality and anonymity:* ICF International, the international consulting agency contracted to manage the DHS survey for USAID, requires all external investigators to obtain ethical approval before the DHS datasets for individual countries can be accessed. Each application is reviewed and approved by the ICF International Institutional Review Board (IRB) in accordance with all ethical protocols. The IRB granted the study ethics approval in November 2016. The 2010 Malawi DHS was conducted in accordance with the principles of informed and voluntary participation, and privacy and confidentiality.

4.10.3 Archival research

- *Anonymity and confidentiality:* Each inpatient record was anonymised using serial numbers (no identifying information was recorded). Only the sex and age, diagnosis and village of the inpatients were recorded. No patients were recruited or contacted at any time. The registers were accessed with the approval of the District Health Officer (DHO) after consulting pertinent hospital staff.
- *Avoiding disruption:* Precautions were taken to minimise the impact of conducting the research on health care services through, for example, alternating data collection between wards to minimise impact on the hospital's record keeping procedure.

4.10.4 Ethnography

Informal observations and discussions:

- *Recruitment and informed consent*: Casual conversations were spontaneous due to the nature of living in a social environment for an extended period of time. The selection of places and observees was similarly spontaneous. Informal observations and discussions thus entailed passive inclusion, whereby obtaining individual consent was unnecessary and, in many cases, impractical. While informed consent is a principal ethical requirement in sociological research, it can be waived when "the research could not practicably be carried out were informed consent to be required" (ASA 1999: 14). In all cases, confidentiality was maintained. In cases where I interacted continuously with key informants, such as local officials, I made it clear that our discussions were part of the research. In such cases, informed consent was obtained informally.
- *Confidentiality and anonymity*: No identifying information was recorded during informal discussions, including particular places/property addresses.
- *Exclusion and inclusion criteria*: No children under the age of 18 years or other vulnerable groups were directly engaged.

FAPO with HSAs:

- *Informed consent*: Informed consent was obtained from HSAs (primary observees), their supervisor (the District Environmental Health Officer (DEHO)) and the community members they serve (secondary observees). The HSAs were instructed to briefly introduce the investigator and explain their presence to community members they interacted with. Participant Information Sheets were made available to all participants.
- *Participation:* The type of observation used was 'non-participant observer', a non-intrusive method of collecting data through observation. Measures to reduce the potential for intrusion and disruption were taken (e.g. standing clear of the HSA during their work).
- *Representation*: The investigator was careful not to misrepresent himself as a HSA or other health professional.
- *Recruitment*: HSAs were selected from initial meetings with the DEHO. Participant Information Sheets were given to all HSAs. The terms of access to observe the HSAs were re-negotiated with HSAs on a continuous basis depending on the nature of engagement. To limit disruption, all questions were posed to HSAs outside working hours.

- *Engagement and participant discomforts*: The researcher did not engage directly with any of the secondary observees. The researcher planned to excuse himself if a secondary observee became noticeably uncomfortable, but this was not required.
- *Confidentiality*: In cases where the HSAs or the secondary observees shared confidential information, the investigator stopped taking notes. The investigator clarified what information was deemed confidential in situations where it was not explicit. Under no circumstances was identifying information recorded.
- *Anonymity*: The name of each HSA was recorded on the Informed Consent Sheet. Each HSA was allocated a corresponding serial number for the purposes of note taking and follow-ups.
- *Exclusion and inclusion criteria*: Unaccompanied children who visited the HSAs were excluded from observation. Other vulnerable groups who were not able to give informed consent competently (including those with serious cognitive disabilities) were excluded as well. In such cases, the researcher excused himself.

Semi-structured interviews:

- *Recruitment:* Many participants were preselected based on initial field visits to Karonga Town in February and August 2016. Other participants were selected based on a list of all relevant actors and institutions compiled by Urban ARK staff. All participants were contacted for interview using their email addresses or phone numbers.
- *Informed consent:* Prior to the interviews, the researcher obtained informed consent from each participant after sharing a Participant Information Sheet. In cases where an informant did not speak English, the research assistant explained its content in local vernacular.
- *Confidentiality and anonymity:* The name and position of the participants was recorded on the Consent Forms for the purposes of follow-ups. All notes taken during the interview were linked to the consent forms using serial numbers to protect confidentiality and anonymity.

Secondary data:

- *Anonymity and confidentiality*: All secondary datasets collected were publicly available and permissible to use at the time of the study. No datasets contained any personal or identifying information.

4.11 Limitations

Three research limitations are identifiable. First, case studies have been criticised for being unable to generalise findings. This criticism has been voiced by quantitative researchers who typically rely on probability samples drawn from large populations to permit generalisation from sample to population (Blaikie 2010). However, the case study design was not used to make generalisations to larger populations (statistical generalisation). It was rather used to provide a detailed understanding of local conditions. If descriptions are sufficiently detailed, Yin (1994) argues that the findings can be generalised to other cases with similar conditions (analytical generalisation). Here, detailed empirical and theoretical insights from the case of Karonga Town were identified and used to identify hypotheses (demographic, environmental and institutional) that can be tested in similar cases, as outlined in Chapter Eleven (section **Error! Reference source not found.**).

Second, it is difficult to fully explain all possible associations between all determinants of environmental health. The study therefore narrowed its focus to diseases and health conditions with known environmental contributions. It is also difficult to accurately detect characteristics in the environment that may affect health by modifying the effect of other causal factors that mediate or confound associations between other risk factors and health (Galea and Schulz 2006). While most quantitative studies on urban health assume linear associations, in most complex systems, non-linear associations are common, though difficult to explain (ibid). These difficulties were addressed through incorporating complexity thinking into the theoretical framework, as outlined in Chapter Three (section 3.1.2).

Third, my identity as a Caucasian male in a predominately Malawian society prevented me from fully immersing myself socially and from observing daily practices and activities anonymously. In public spaces, I was continuously identified as a “Mzungu” (white person) or as a “Mzungu-China” (some people, particularly children, could not discern by racial identity) and approached out of curiosity or hope of employment or cash donation. Conversely, my identity may have facilitated social interactions with people I may have not otherwise come into contact with, although it could have influenced their behaviours. My observations therefore cannot be assumed to accurately reflect reality, despite my best efforts to validate them. Notwithstanding, it is impossible for any researcher in the social sciences to separate themselves from subjects under study. This is why the method of ‘interpretive reflexivity’ was adopted in order to continuously re-assess how my social identity and status influences my interpretations of reality (Lichterman 2015) and configures power relations between the ‘researcher’ and the ‘researched’ (Griffiths 2015), as discussed in section **Error! Reference source not found.**.

4.12 Conclusion

This Chapter outlined a methodology to address the research question and objectives based on the analytical framework introduced in Chapter Three. To situate Karonga Town as a terrain of urban research and theory-building, the case study design was adopted in combination with a mixed-methods approach utilising quantitative analyses to assess the demographic importance of smaller urban centres in Malawi and to compare the distribution of environmental health problems and their determinants between urban centres of different sizes.

To reveal the environmental health situation at the urban scale, the archival research of hospital records seeks to assess environmental health outcomes and their socio-spatial distribution in Karonga Town. In turn, the ethnographic research seeks to identify the determinants of these outcomes and their complex interactions and to explore the planning systems that shape the quality of the environment. Adopting a multi-scalar approach allows for the environmental situation in the town to be contextualised in relation to that of other urban centres of different sizes throughout the country, with the intention of providing new insights into the inter-urban distribution of environmental health and its implications for urban planning in Malawi.

Chapter 5 Background

This Chapter zooms into the urban situation in Malawi by offering a background description of the historical and contemporary processes of change shaping its late urban transition in the East African context, with a focus on urbanisation patterns and trends, geographic and climatic conditions, the economy, socio-economic conditions, and governance. Particular attention is paid to the features of Malawi that both differentiate and relate it to surrounding countries from an area studies perspective. A parallel description of Karonga Town is then presented to contextualise its position in the national urban system and to explore its evolving urban condition.

In setting the scene, this Chapter reveals why Malawi has been slow to urbanise relative to surrounding countries and interrogates why so little is known about urbanisation patterns and trends at the national and especially sub-national scale. The lack of detailed census data and clear statistical criteria for defining urban settlements are identified as key barriers for understanding urban size distributions and urban growth rates for individual centres, particularly at the bottom of the urban hierarchy, making it difficult to discern the demographic importance of smaller settlements. This discussion provides a backdrop for the analysis of census data provided in Chapter Six.

The discussion that follows explores how the absence of a local government for Karonga Town is contributing to the accumulation of numerous environmental hazards of different sizes and frequencies (everyday, seasonal and episodic) and the risks they present for the health of the town's rapidly expanding population. Particular attention is paid to the local governance challenges that in situ urban change is creating as government institutions seeking to incorporate urbanising populations into planned townships conflict with existing chieftaincy structures struggling to maintain territorial control, resulting in planning failure and consequent environmental hazards.

Providing such a discussion is not an easy task given the lack of data on Malawi's urban transition and especially on Karonga Town's growth. This gap is partly due to the limited attention paid to urbanisation in academic and policy circles and the lack of a clear definition of what a small town is, as discussed in Chapter Six (section 6.2). This Chapter nevertheless draws on available secondary material, including academic studies, policy documents and reports by national and international agencies, and primary data mainly from the ethnographic research. In setting the scene, this Chapter provides a backdrop for those that follow.

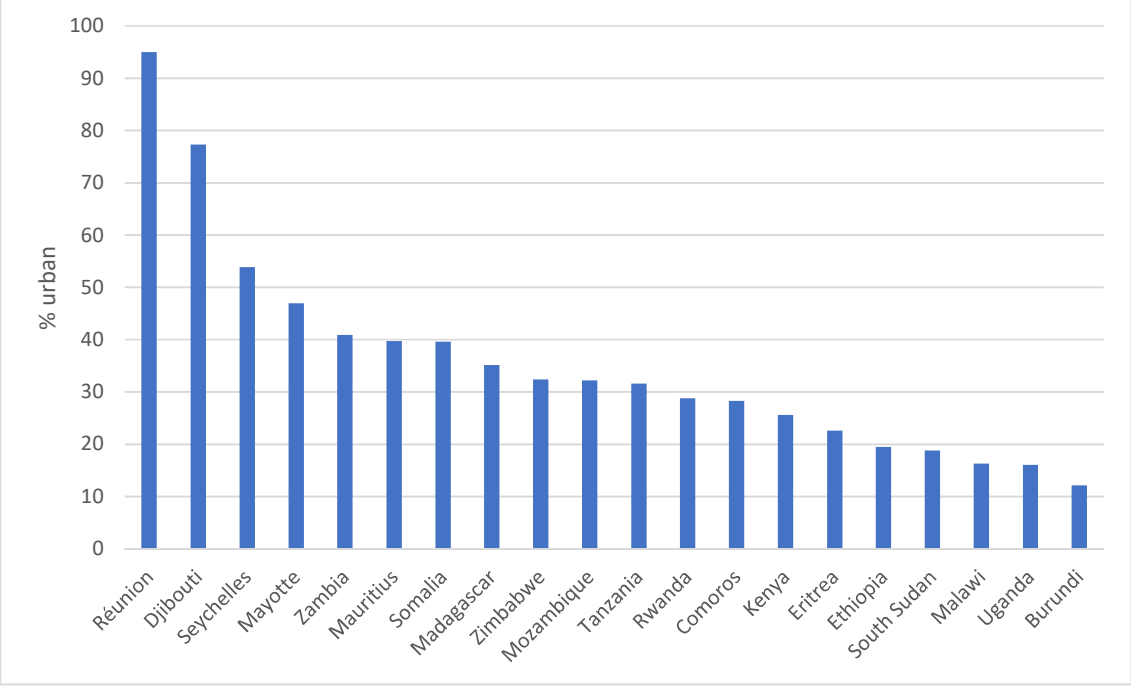
5.1 Understanding Malawi's urban trajectory

This section assesses Malawi's urban trajectory and the factors shaping its relatively late urban transition in the context of East Africa. In adopting an area studies perspective, Malawi's urban transition is positioned in relation to that of surrounding countries, exposing both common trends and key differences regarding urbanisation patterns, geographic and climatic conditions, economic structures, socio-economic conditions, and governance regimes.

5.1.1 Urbanisation patterns and trends

Malawi's urban transition began after the arrival of the British Colonial Administration in 1891 and the subsequent development of colonial administrative and trading centres (UN-Habitat 2010c). Malawi has, however, been slow to urbanise relative to other countries in the region. Census data compiled by UNDESA (2015) indicate that as of 2015, Malawi was the least urbanised country in East Africa and the continent as a whole following Uganda and Burundi (Figure 5.1). Malawi's relatively low urbanisation level of around 15%, up from just 8% in 1977, has been attributed to its narrow and limited economy, historically dominated by agriculture, and high levels of economic dependence on surrounding countries (Potts 1985b). Malawi's urban system thus remains under-developed, particularly at the lower- and middle-levels of the urban hierarchy, as discussed below.

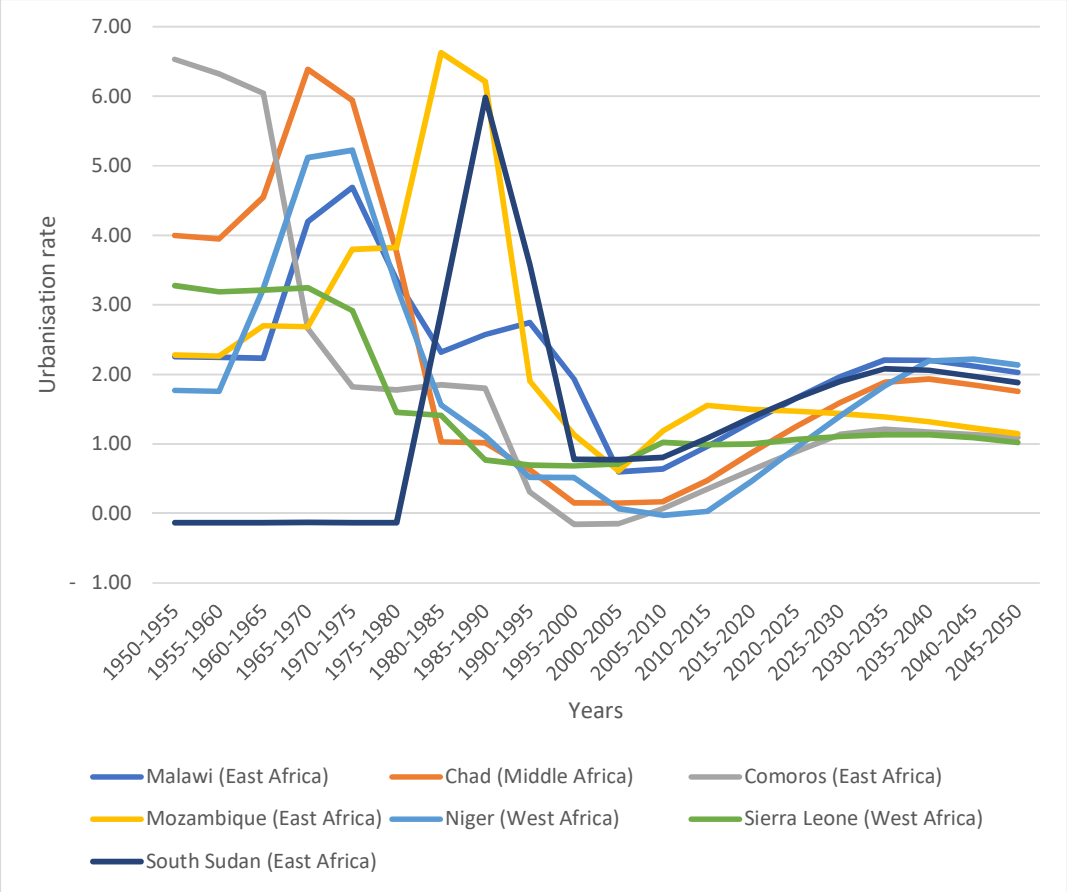
Figure 5.1: Urbanisation levels for countries in East Africa, 2015



Data from UNDESA (2015), compiled and presented by author

While urbanisation rates across the continent are expected to decline overall, as discussed in Chapter Two (section 2.1.1), Malawi—alongside Chad, Comoros, Mozambique, Niger, Sierra Leone and South Sudan—is reported to be among several African countries that are expected to have increasing rates (Figure 5.2) (UNDESA 2015). The World Bank (2016a) states that urbanisation projections for Malawi have, however, been on the high side; some estimates indicate that Malawi is urbanising as rapidly as at 5.2% per annum (Manda 2013). At this rate, Malawi's population would become 50% urban by 2050 (ibid). The World Bank's (2016a) analysis of census data for the inter-censal period between 1998 and 2008 indicates that Malawi's annual urbanisation rate is lower at 3.7%-3.9% and slower than other agrarian African countries, such as Rwanda and Uganda, with similar urbanisation levels. At this rate, 30% of Malawi's population is expected to live in urban areas by 2050. The World Bank thus argues that Malawi's population is urbanising at a moderate pace, in spite of some alarmist projections (ibid). Moreover, these and other projections of Africa's urbanisation project forwards at a constant rate over 35 years, which is both unrealistic and would be unprecedented. Such projections should therefore be treated with caution.

Figure 5.2: African countries with increasing urbanisation rates, 1950-2050



Data from UNDESA (2015), compiled and presented by author

To this point, urbanisation dynamics have received little attention in national policy discourses given that Malawi is still at the initial stages of its urban transition (Manda 2013; World Bank 2016a). Most attention that has been paid to urbanisation has historically been negative, with most national policies seeking to discourage the process in favour of rural development. For instance, the current Malawi Growth and Development Strategy II (MGDS-II) supports the establishment of a green belt in order to reduce rural-urban migration and contains policies aiming to reduce the "vulnerabilities caused by… rapid urbanization" (GoM 2011: 40). However, the census data presented above indicate that Malawi is both less urbanised and less rapidly urbanising than surrounding countries (World Bank 2016a).

In addition to being relatively un-urbanised, Malawi's urban system is spatially imbalanced. The distribution of urban centres has been historically concentrated in the Southern Region as the primary site of European settlement and agricultural production (mainly tobacco and tea) in the colonial period (from 1891 to 1964) (Potts 1985b), as discussed below. At independence, 75% of Malawi's urban population lived in Blantyre, Zomba and Lilongwe, while the remainder of the urban system was predominated by small administrative district centres and trading posts (ibid; Kalipeni 1997). Today, the South continues to contain the majority of the urban population and urban centres, including Blantyre, the commercial capital, and Zomba, the former capital city (Manda 2013).

In an effort to redistribute the urban population away from the three largest cities (historically Blantyre followed by Lilongwe and Zomba), Kamuzu Banda, Malawi's first post-independence president (from 1961 and 1994), adopted several rural development strategies, including the relocation of the capital from Zomba to Lilongwe, investment in infrastructure in the Central and Northern Regions, and the development of 'growth centres' in rural districts (Kalipeni 1997), as discussed in Chapter Six (section 6.1). Consistent with the optimistic view of smaller urban centres reviewed in Chapter Two (section 2.1.3), these strategies reflected the idea that it is easier to manage small towns that are evenly distributed rather than the 'explosive' growth of the largest cities (Riddell 1978; Rondinelli and Ruddle 1978).

Emerging land and infrastructure pressures in Blantyre and Lilongwe were observed in the early 1980s, following the recession and the implementation of structural adjustment (Du Mhango 1984), which motivated strategies aimed at curbing rural-urban migration and redistributing the urban population (see Kalipeni 1997). Such strategies are not unique to Malawi, however; a survey by the UN found that 67% of all countries in the world have policies aimed at curtailing and reversing rural-urban migration, even though natural increase is now the main driver of urbanisation in most sub-Saharan African countries (UN-Habitat 2013), as discussed in Chapter

Two (section 2.1.1). The drivers of urbanisation are, however, reported to be different in Malawi where rural-urban migration is estimated to be more important than natural increase (NSO 2008; Manda 2013; World Bank 2016a), although the drivers of Malawi's urban transition remain unclear in the absence of sufficient evidence.

Despite sustained efforts to decentralise urban growth, a recent assessment of census data prepared for the Ministry of Lands, Housing and Urban Development (Manda 2013) found that 78% of Malawi's urban population lived in the four largest cities in 2008, while the remaining 22% lived in what the National Statistical Office (NSO) ambiguously terms 'other cities' (NSO 2008). The statistical criteria used by the NSO to define urban centres is not only unclear, but also differs from those used by the Physical Planning Department under the *Town and Country Planning Act* of 1991 (Manda 2013). Under the Act, urban areas fall into three legal categories: (a) urban areas that are formally declared as a city (including Lilongwe, Blantyre and Mzuzu) or municipality (including Zomba); (b) urban areas that are formally declared as towns (including Karonga Town, Kasungu, Lunzu, Liwonde, Luchenza, Salima, Mangochi and Balaka); and (c) urban areas that have not been formally declared as cities, municipalities or towns, but that display urban characteristics, including plans adopted to guide future infrastructure development (including some 'growth centres') (Cammack et al. 2009). The different criteria used by national agencies to define urban areas obscures the share of the urban population at different levels of the urban hierarchy, especially at the lower end.

This statistical ambiguity is problematic given the longstanding recognition that the number of smaller urban centres in Malawi is growing: "One of the significant elements in the increasing level of urbanisation in Malawi is the development of new, relatively small towns that are growing at fairly rapid rates" (Segal 1985: 316). While the drivers of small town growth vary widely, as discussed in Chapter Two (section 2.1.2), in situ urbanisation is likely to be one of the most significant given that Africa is the only continent that is expected to experience substantial growth in its rural population due to high rates of natural increase (Africapolis 2009). Re-classification of rural villages as urban is likely to remain an important driver of urbanisation for this reason.

While in situ urbanisation has not been studied systematically in Malawi, it is likely important given the country's small land area, high population densities, consequent land shortages (particularly in the Southern Region), and widespread dependence on agriculture (Potts 2006). Malawi also ranks eighth among countries in the world with the largest projected increases in their rural populations between 2014 and 2050 (Table 5.1).

Table 5.1: Ten countries with the largest projected increase in rural population between 2014 and 2050 and relative change in rural population

Rank	Country	Projected change in rural population between 2014 and 2050	Relative change in rural population (%)
1	Nigeria	50,157,000	53
2	Ethiopia	38,908,000	49.8
3	Uganda	37,991,000	116.1
4	Niger	29,737,000	196.8
5	Tanzania	25,776,000	73.5
6	Democratic Republic of the Congo	21,181,000	52.6
7	Kenya	20,467,000	60.1
8	Malawi	14,646,000	103.7
9	Philippines	13,171,000	23.7
10	Sudan	13,020,000	50.6

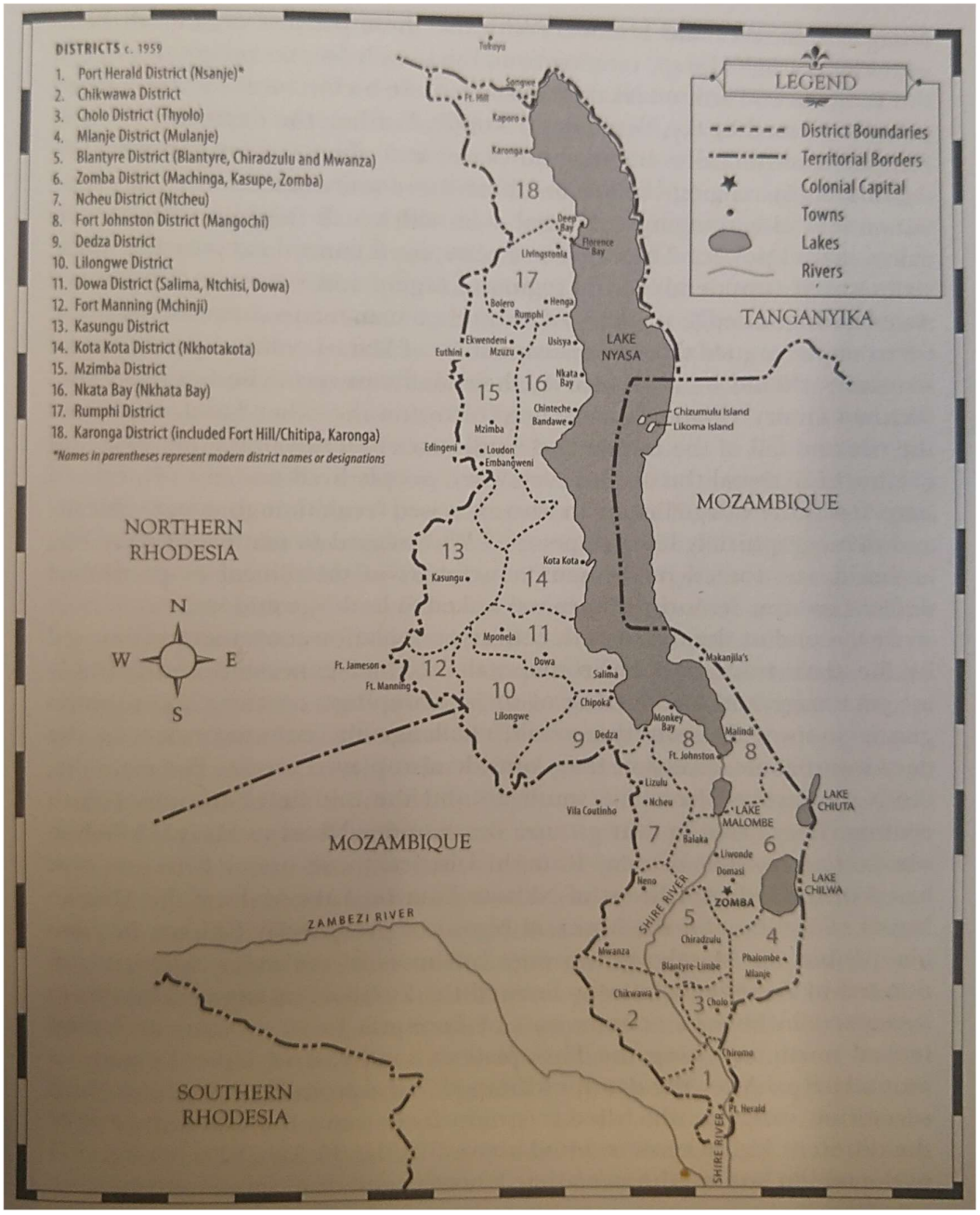
Data from UNDESA (2015), compiled and presented by author

Despite growing interest in Malawi's urban transition, the contribution of smaller urban centres to national urban growth and urbanisation remains unclear in the absence of sufficient data and research. The analysis presented in the following Chapter provides new estimates of the share of the urban population living at different levels of the urban hierarchy, providing new insight into urbanisation patterns and urban size distributions.

5.1.2 Geographic and climatic conditions

Malawi is a small land-locked country in East Africa surrounded by Tanzania to the north, Mozambique to the south, and Zambia to the west and north west (Figure 5.3). To the east lies Lake Malawi, the third largest in the East African Rift Valley, accounting for around 20% of the country's total area (Kalinga et al. 2018). The narrow strip of land that Malawi occupies spans 840 kilometres from north to south and varies in width from 10 to 160 kilometres (ibid). Malawi's curious shape was artificially determined in 1897 when the British Foreign Office fixed its national borders based largely on the natural features of the East African Rift Valley, which extends down Lake Malawi to the Shire Valley in the south (McCracken 2012). The area known today as Malawi was named Nyasaland (land of the lake) in 1907 after its control was transferred from the British Foreign Office to the Colonial Office (Power 2010), as discussed below. While district boundaries shifted slightly during the colonial period, Malawi's national boundaries did not (ibid).

Figure 5.3: Map of Malawi



Source: Power (2010)

Of central importance to the history of human settlement in Malawi are several upland plateaus, which include the Shire Highlands in the Southern Region, the Lilongwe or Central Province in the Central Region, and the Mzimba plain in the Northern Region (McCracken 2012). These plateaus comprise 75% of Malawi's land area, range in height from 2,500 to 4,000 feet and are divided by steep escarpments. By the late nineteenth century, the valleys between the plateaus provided refuge for a large, albeit unevenly distributed, population attracted to the area by the

availability of water supplies throughout the year and fertile alluvial soils, notably in the Karonga plain (Figure 5.5) and in the Lower Shire Valley in the south (ibid).

Figure 5.4: View of Chiweta from the escarpment at Livingstonia, Karonga District

Photo credit: Author (2018)

Favourable environmental conditions in such areas explain in part why Malawi has a much higher overall population density than surrounding countries (McCracken 2012). Malawi's population density of 142 people per square kilometre is nearly three times larger than that of Tanzania's and Zimbabwe's, four times larger than that of Mozambique's, and seven times larger than that of Zambia's, whose population is smaller than Malawi's, despite having more than six times the land area (Table 5.2). Population densities in Malawi vary regionally, however; the Southern Region had the highest population density at 185 people per square kilometre, followed by the Central Region at 154 people per square kilometre and the Northern Region at 63 people per square kilometre in 2008 (the last census year) (NSO 2008). Variations in regional density levels have been attributed to the concentration of colonial settlements, estate agriculture (particularly tea and tobacco) and infrastructural investment (particularly transport) in the South (ibid; Potts 1985b; Kalipeni 1997; Potts 2006), as discussed above. High overall population densities explain the small size of landholdings in the country, which is evident from satellite images that show clear differences in land use in Malawi relative to Zambia to the west, Tanzania to the north and Mozambique to the east and south east (Potts 2006).

Table 5.2: Population densities in Malawi compared to neighbouring countries

Country	Land area (square kilometres)	Population estimate (in 2014)*	Population density (per square kilometre)
Malawi	118,484	16,829,000	142
Tanzania	945,087	50,757,000	54
Zimbabwe	390,757	14,599,000	37
Mozambique	801,590	26,473,000	33
Zambia	752,618	15,021,000	20

*Data from UNDESA (2015), compiled by author

While climatic conditions vary throughout the country depending on altitude and lake influence, common trends are identifiable (Vincent et al. 2014). Malawi has a sub-tropical climate characterised by seasonal changes in precipitation, with the rainy season generally occurring between November and February (ibid). Like many Southern African countries, Malawi's rainfall is strongly influenced by the weather system referred to as the Inter-Tropical Convergence Zone, which passes to its southern boundary in December and January before retreating north in February and March (McCracken 2012). Precipitation during the rainy season ranges from 150 millimetres to 300 millimetres per month, although inter-annual rainfall variability is difficult to predict due to the El Niño Southern Oscillation (ENSO) effect (Vincent et al. 2014). Unlike more arid territories further south, however, Malawi benefits from the Southeast Trade winds blowing across the Indian Ocean that bring additional rain in April, which, in the north, continue intermittently into May (McCracken 2012). Malawi's proximity to the East African coast also means it benefits from light rain, including in the dry season. As a result, Malawi enjoys an average annual rainfall of around 1,140 millimetres, a figure higher than neighbouring countries (ibid).

Mean temperatures range between 18 degrees Celsius and 27 degrees Celsius, with temperatures decreasing with altitude (McSweeney et al. 2010). The Lower Shire Valley in the Southern Region drops to the plain level, with temperatures regularly exceeding 33 degrees Celsius during the day for extended periods of time, making it one of the hottest places in the country (ibid). Variable precipitation and temperature patterns have resulted in drought in many areas, although regional variations in rainfall mean that droughts affecting one district may not affect surrounding ones (McCracken 2012). For example, Cholo and Mulanje Districts in the south have average rainfalls of between 1,650 and 2,030 millimetres per year compared with just 838 millimetres in the neighbouring Lower Shire Valley (ibid).

Variations in precipitation have resulted in differential exposure to flood events within and between districts. The most flood-prone areas tend to concentrate in and around rivers and

lakes, especially the Shire River in the south, around Lake Chiuta and Chilwa in the south east, and the North Rukuru in the north (Karonga Town is located in the North Rukuru flood plain) (Thieme and Jacobs 2011; Manda et al. 2016). Floods have become a growing problem in many urban centres that are expanding in and around low-lying areas, as observed in Mzuzu (Kita 2017) and Karonga Town in the North (Manda and Wanda 2017), Blantyre in the south (UN-Habitat 2011a) and Lilongwe in the Central Region (UN-Habitat 2011b). Despite increasing interest in urban flood risk, however, the nature and scale of urban risk in Malawi remains under-studied. This is a key gap that this study seeks to address in later Chapters.

Malawi's challenging climatic conditions and geographic constraints, including its limited access to major ports, have been identified as factors explaining its relatively late urban transition (Potts 1985b). However, the national government expects climate change in combination with disasters, environmental degradation, a lack of off-farm economic opportunities, and diminished land holdings in rural areas to contribute to rural-urban migration (Brown 2011). But the accuracy of this claim remains uncertain in the absence of sufficient evidence. Some studies indicate that push factors in rural areas may motivate migrants to stay in cities for longer periods of time or to engage in circular (rural-urban-rural) migration as a coping mechanism, while other studies indicate that urban livelihoods may be impacted due to cities' dependence on rural products (such as food and biofuel), potentially motivating return migration to rural villages (Suckall et al. 2015).

Studies also show that intra-rural migration is increasing. Potts (2006) found that the Southern Region, formerly Malawi's economic centre and destination for migrants, "has become the region with the highest incidence of poverty and an area of net outflow of migrants to the regions further north. Furthermore, in the last decade of the twentieth century it has become clear that the Northern Region, once known as the country's 'dead north', has become a net attractor of rural migrants" (ibid: 305). This evidence indicates that while the Northern Region has historically been a net loser of migrants, land pressures in the South may be leading to shifts in the regional distribution of the population linked to livelihood dynamics. While it is difficult to infer what these trends mean for urbanisation patterns, they suggest that the Northern Region may become an increasingly popular destination for rural migrants seeking access to land and livelihoods, which could hypothetically contribute to the growth of Karonga Town and other emerging centres in the North.

5.1.3 The economy

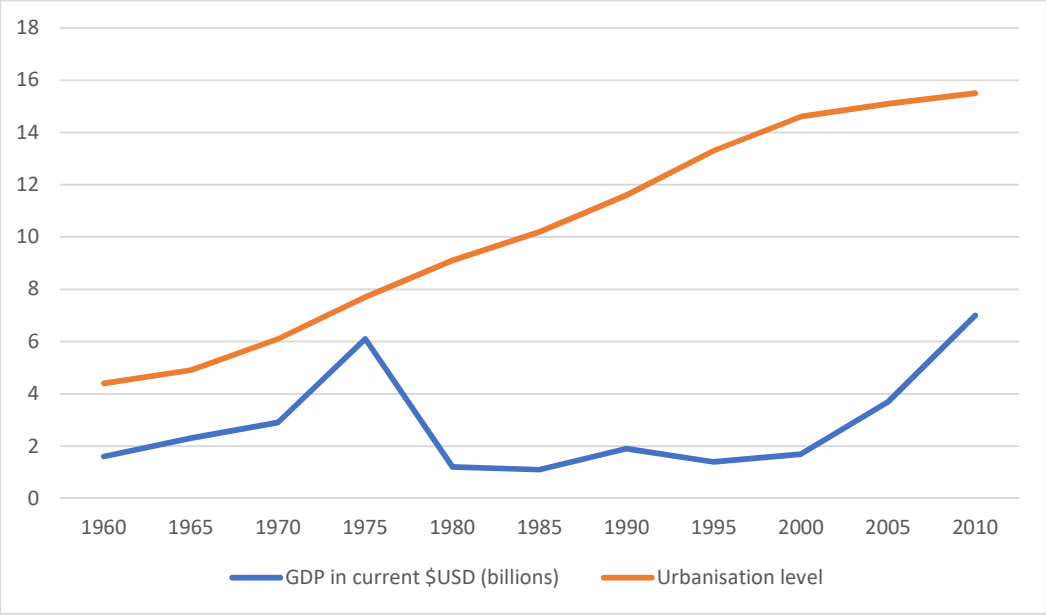
Aside from the lake and the prevalence of fertile soil, Malawi has no other significant natural resources, with its economy almost entirely dependent on cash-crop agriculture (namely tobacco, sugar, tea, coffee and cotton) and subsistence agriculture (namely maize and to a lesser extent cassava, groundnuts, pulses, sorghum, millet and sweet potatoes) (Chirwa et al. 2006). Historically, Malawi has been viewed as a food supplier as well as a labour reserve for surrounding colonies with more intensive mining activities (Barber 1961). The British colonial administration encouraged agricultural production to support the regional maize trade and ensure a stable food supply for miners in South Africa and Northern Rhodesia (present-day Zimbabwe) (ibid). Kamuzu Banda, Malawi's first post-independence President, who was also the Minister of Agriculture, similarly encouraged agriculture to meet national food security objectives and generate foreign exchange on the maize market (Mkandawire 1999). Post-independence policies have continued to emphasise agriculture as a key driver of national economic growth given the large share of the population living in rural areas (GoM 2011).

Agriculture remains the most important sector of Malawi's economy, accounting for an estimated one-third of gross domestic product (GDP) in 2017 (World Bank 2016a). However, the national economy is showing signs of structural change, with industry being the major driver of economic growth due primarily to the expansion in manufacturing and construction, which grew at an annual rate of 5.4% as compared to agriculture at 3% between 1998 and 2013 (World Bank 2016a). Unfavourable weather conditions and disasters (particularly floods and drought) have impacted the performance of agriculture alongside energy and poverty reduction (GoM 2011). Estimates indicate that maize production declined by 12% in 2015 and 2016 due to flooding in the south and country-wide drought, with 17% of the population failing to meet their food requirements (World Bank 2016b). Despite agriculture's declining economic performance, estimates indicate that GDP grew modestly at 2.6% in 2016 (ibid).

The World Bank (Fay and Opal 2000) and others (Jamal and Weeks 1993) have suggested that urbanisation in Malawi, like other sub-Saharan African countries, is not associated with economic growth. This suggestion emerged during the 'lost decades' of the 1980s and 1990s, a period of unmatched economic hardship for African countries simultaneously affected by the impacts of structural adjustment (especially in terms of slashing public expenditure on social services), declining terms of trade for primary export commodities, and deteriorating world trade conditions (particularly for non-oil producers) (Stren and White 1989; Simon 1997). This period did not result in decreasing rates of rural-urban migration and urbanisation as many economists expected (Potts 2016).

Based on available data, this trend appears to be evident in Malawi, where the urbanisation level has steadily increased, despite fluctuations in GDP growth rates over time, particularly during the 1980s and 1990s, when GDP fell to record lows (Figure 5.6). During this period, retrenched workers were forced into a large and rapidly growing informal sector, which is currently estimated to account for 90% of Malawi's labour force, a figure reportedly similar to neighbouring countries (Danish Trade Union Council for International Development Cooperation 2014).

Figure 5.5: GDP rates compared with the level of urbanisation in Malawi, 1960-2010



Data Source for GDP rates: World Bank (2018)
Data source for urbanisation levels: UNDESA (2015)
Data compiled and presented by author

While Malawi's urban economy is beginning to show signs of structural change, the lack of detailed data on urban centres obscures the composition of their labour markets and their contribution to national economic growth. Available data nevertheless indicate that Malawi's four largest cities account for a large share of the national economy, contributing 33% to national GDP, despite accounting for 15% of the national population in 2008 (World Bank 2016a). 'Other' urban centres (undefined) reportedly contribute 6% of national GDP, despite accounting for 3% of the national population in that year (ibid).

A recent analysis by the World Bank (2016a) indicates that urbanisation may not be driving structural transformation in Malawi based on the observation that nearly one-third of rural jobs are in non-farm activities, while one in six urban jobs are in agriculture (Figure 5.7), reflecting

broader patterns in the region (Reardon et al. 2006; Nagler and Naudé 2017). This observation is consistent with Malawi's relatively small urban population and slow urban transition. However, while the majority of the urban population lives in the four largest cities, as indicated above, the share of the urban population in settlements at the bottom of the urban hierarchy may be under-estimated due to the lack of population size criteria used by the NSO to distinguish the smallest centres from rural areas, as discussed in Chapter Six (section 6.2). It is therefore plausible that smaller urban centres with labour specialisations in non-farm activities may be classified as rural, meaning their contribution to structural transformation may be under-estimated as well.

Figure 5.6: Share of employment in farm and non-farm activities in urban and rural areas of Malawi

	Share of total regional employment, 2013			Share of total sector employment, 2013			Share of total national change in employment, 1998-2013 (%)		
	National	Urban	Rural	National	Urban	Rural	National	Urban	Rural
All sectors	100	100	100	100	11.6	88.4	100	17.3	82.7
Agriculture	64.1	16.4	70.4	100	3.0	97.0	-16.4	1.6	-18.0
Industry	7.4	16.7	6.2	100	26.2	73.8	19.8	2.3	17.5
Mining	0.3	1.1	0.2	100	41.9	58.1	1.3	0.6	0.7
Manufacturing	4.1	7.7	3.6	100	21.7	78.3	10.4	0.8	9.7
Utilities	0.4	0.8	0.4	100	22.3	77.7	1.4	0.0	1.4
Construction	2.6	7.2	2.0	100	32.0	68.0	6.7	1.0	5.7
Services	28.5	66.9	23.5	100	27.2	72.8	96.6	13.4	83.2
Trade services	16.9	34.8	14.6	100	23.2	76.8	62.1	8.8	53.3
Transport, communication	2.0	5.4	1.6	100	31.4	68.6	7.4	1.2	6.2
Financial, business services	0.9	3.9	0.5	100	49.9	50.1	3.9	1.7	2.2
Community, public services	8.7	22.8	6.8	100	31.0	69.0	23.3	1.8	21.5

Source: World Bank (2016a)

While this is speculative, it is plausible in light of studies, reviewed in Chapter Two (section 2.1.3), revealing the important role played by in situ urbanisation in rural livelihood diversification, as observed in Tanzania (Christiaensen et al. 2013; Christiaensen and Todo 2013) as well as Côte d'Ivoire, Ghana and Mali (Potts 2018). The analysis of census data in the following Chapter presents new estimates of the share of the urban population living in smaller urban centres and their growth rates. However, more detailed data would be required to assess the share of their labour markets in non-farm activities. As a result, the precise contribution of smaller urban centres to livelihood diversification in Malawi remains unclear.

5.1.4 Socio-economic conditions

With around 85% of the population living in rural areas in 2008 (the last census year), Malawian society remains largely dependent on agriculture (NSO 2012). Malawi's intensifying land:population ratio, particularly in the south, has motivated relentless concern in academic

and policy circles grounded in neo-Malthusian theories promoting population control programmes to combat environmental degradation (see Pike and Rimmington 1965; Moyo et al. 1993; Kalipeni 1994). Malawi has, however, enjoyed a relatively good national food self-sufficiency record due in large part to the adaptability of smallholder farmers (Potts 2006), despite the recent impacts of country-wide drought on food security (World Bank 2017), as discussed above.

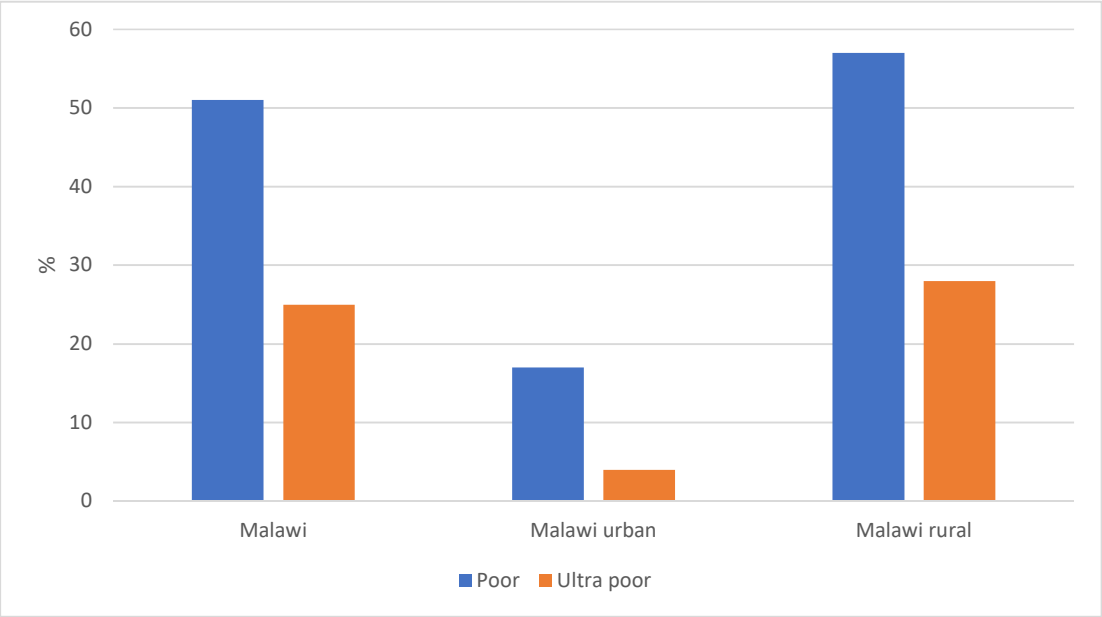
While Malawi's population remains predominately rural, it is urbanising and so too is poverty (Manda 2013). The NSO (ibid) defines poverty based on total per capita annual cost estimates for minimum food and non-food essentials. Food essentials represent the cost of a food basket that provides the daily individual requirement of 2,400 calories, whereas non-food essentials represent the average individual non-food consumption near the food poverty line. Individuals who live in households with food and non-food consumption below the poverty line are classified as 'poor'. According to the NSO, this includes individuals who earn less than Malawi Kwacha (MK) 37,000 per day (about US$ 0.67). The NSO further defines individuals who earn less than MK 22,956 (about US$ 0.41)[6] per day as ultra poor. These poverty lines are considerably less than the US$ 1 dollar-a-day poverty line[7], reflecting Malawi's status as one of the world's poorest countries.

Based on the NSO's definition, 51% of the national population in 2011 was poor, of which 5% lived in urban areas. In these areas, 17% were poor, while 4% were ultra poor. By comparison, of the 51% of the national population who were poor in that year, 95% lived in rural areas. In these areas, 57% were poor, while 28% were ultra poor (Figure 5.8). These figures suggest that rural areas contain a much larger share of the poor and ultra poor than urban areas.

[6] Since the NSO (2012) report did not convert figures from MK into US$ dollars, they have been converted based on the exchange rate on 31 March 2010. This was the month in which the survey was administered.

[7] The dollar-a-day poverty line is the primary method used by national and international agencies to define and measure poverty (Satterthwaite 2004). Poverty lines seek to establish how many people have incomes that are below the amount required to afford basic needs. They are typically based on two aspects: (a) allocations for food based on the cost of a minimum food basket; and (b) allocations for non-food essentials based on what an average low-income household would typically spend (ibid).

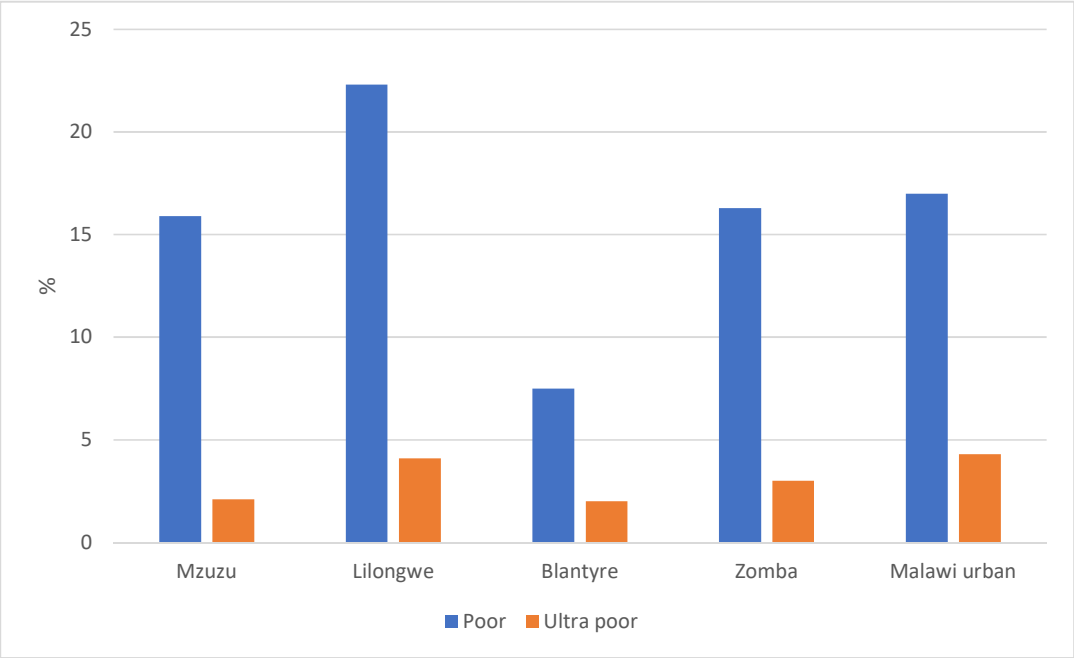
Figure 5.7: Urban versus rural poverty levels in Malawi, 2011



Data from NSO (2012), presented by author

Disaggregated data on urban poverty levels are only available for the four largest cities, so it is not possible to compare differences between urban centres of different sizes. Figure 5.9 nevertheless indicates that levels of poverty differ between the four largest cities, with 22% of Lilongwe's population living in poverty, followed by 16% in Zomba and Mzuzu, and 8% in Blantyre. Figure 5.9 also indicates that 4% of Lilongwe's population lived in ultra poverty in 2011, followed by 3% in Zomba, and 2% in Blantyre and Mzuzu.

Figure 5.8: Urban poverty levels in the four largest cities, 2011



Data from NSO (2012), compiled and presented by author

These statistics seem unrealistically low given the proliferation of urban informal settlements throughout the country (UN-Habitat 2010c). From Satterthwaite's (2004) perspective, the scale of urban poverty is likely underestimated since the NSO's definition does not make adequate allowances for the cost of non-food essentials (such as housing, transport, water, electricity, education, health care), which are typically higher in urban areas (particularly in the largest cities) than in rural areas. This is because many non-food essentials (such as land for housing, water, education, transport) are commoditised in urban areas, particularly in those lacking public provision, as in the case of water, for example (see Kjellén and McGranahan 2006).

The NSO's definition also fails to account for other deprivations (such as insecure tenure, poor quality housing, inadequate services, precarious livelihoods) that not only characterise urban poverty, but that also underpin environmental hazards. As Satterthwaite (2003) argues, "[t]he environmental problems that low-income groups face are often more related to inadequate provision of infrastructure and services, lack of any rule of law, discrimination, and lack of political influence than to a lack of income" (ibid: 81).

Current poverty statistics may therefore grossly understate the share of Malawi's urban population living in low-income and environmentally hazardous settlements. Yet Manda's (2013) analysis of data from the census and integrated household surveys indicates that poverty is urbanising in the absence of sufficient job growth in productive sectors of the urban economy,

which have not been able to absorb migrants and other members of the urban poor fast enough, resulting in the expansion of a large informal sector. The informalisation of Malawi's economy began to occur following the introduction of structural adjustment programmes in 1981 (UN-Habitat 2010c), reflecting broader trends in the region (Potts 1997; Riddell 1997; Potts 2008).

During this period, urban environmental conditions in many countries declined markedly due to declining public expenditure on basic services (such as water, sewerage, electricity, solid waste removal, public transport, health care) compounded by the rapid growth of many towns and cities (Stren and White 1989; Jamal and Weeks 1993). Such conditions have continued to worsen in Malawi in the context of weak national economic performance and ineffective urban planning, resulting in the production of unhealthy living environments. For instance, a recent analysis of child health indicators (neonatal mortality, infant mortality, under-five mortality rates, stunting, proportion of children treated for diarrhoea and fever, proportion of children sleeping under insecticide-treated nets, and children fully immunized at 12 months) from the Malawi Demographic and Health Survey (DHS) and the Multiple Indicator Cluster Survey found a clear pattern of a declining urban health advantage alongside the growth of informal settlements and 'slums' (Lungu et al. 2018).

5.1.5 Governance

The governance of urban development in Malawi, among other former African colonies, was historically influenced by colonial administrations and the modern institutions of local government and urban planning they introduced (Mabogunje 1990; Njoh 2009; Watson 2009; Home 2010; Berrisford 2011). This section provides an overview of the systems of rule imposed by the British in Malawi during the colonial era and the contemporary processes of in situ urban change that are leading to new local governance challenges at the bottom of the urban hierarchy. As I will show, chiefs continue to play key roles in local governance, presenting major challenges for efforts to plan the growth and development of towns after they have already emerged.

Direct and indirect rule

The establishment of colonial rule in Africa centred on 'the native question': "how can a tiny and foreign minority rule over an indigenous majority?" (Mamdani 1996: 16). For Europeans (namely the British and French), the answer was two-fold: indirect rule and direct rule. Under indirect rule, individuals interact with the state through the customary institution of the chieftaincy, with traditional leaders (chiefs) governing autonomously in accordance with traditional norms and

rules prevailing in rural areas. Individuals under this system are seen as 'subjects' (of the chieftaincy). In contrast, direct rule entails a model of differentiated state power in which individuals are seen as 'citizens' based on European notions of 'civilisation'. Individuals under this system are seen as 'citizens' (of the state) (ibid). Direct rule was governed by European laws, including Town and Country Planning legislation, which supported the segregation of the European from the African population to promote social comfort and convenience and health and sanitation in urban settlements (Swanson 1977; Home 2010), as discussed in Chapter Two (section 2.1.5). Mamdani (1996) argues that these two contrasting systems of rule, one rural and the other urban, created a "state that was Janus-faced, bifurcated" (ibid: 18). In the post-independence era, chieftaincy has remained intact in many African countries where the rural/urban distinction continues to be used as an axis to organise the dual state (Eggen 2011).

The following discussion will show how, in Malawi, the in situ urbanisation of rural territories is destabilising the rural/urban axis of the dual state and creating new local governance challenges linked to the role of 'town chiefs' in urban development. The discussion begins by describing how the dual state in Malawi evolved in the colonial and post-colonial periods. It then explores how processes of in situ urban change are resulting in hybrid institutional arrangements in emerging towns.

Chiefs in the colonial era

The British had little interest in the region surrounding Lake Malawi until the end of the nineteenth century when the Portuguese (who colonised neighbouring Mozambique) threatened to invade, motivating the British Foreign Office to declare the area a protectorate in 1891 (Power 2010). Sir Harry H. Johnston, the first British Commissioner to the Lake Malawi region, introduced campaigns to pacify local chiefs and signed treaties of protection that required them to accept British sovereignty. By the time the Colonial Office took control of Malawi (then Nyasaland) in 1907, the colonial enterprise had moved beyond protection toward an economic and political project to unfold over the next six decades (ibid).

Indirect rule was introduced with the *District Administration (Native) Ordinance* (DANO) of 1912. The DANO replaced the previous system of tribal rule which, according to the British Colonial administration, had "fallen into decay" (quoted in Eggen 2011: 316). The DANO created a new hierarchy of 'traditional' authority led by Principal Headmen appointment by the District Commissioner (DC) to assist in upholding general welfare (Cammack et al. 2009). The DANO was amended in 1924 to extend the power of the Principal Heads to levy fines, collect taxes, hear civil cases, sell licenses and control afforestation (ibid).

Indirect rule was consolidated with the 1933 *Native Authority Ordinance* (NAO) and *Native Courts Ordinance* (NCO), which gave traditional authorities (now Native Authorities) widespread powers of local government, but under the control of the DC (Eggen 2011). The Principal Headmen were empowered to make rules and orders involving "cleanliness and sanitation, control of infectious diseases, control of fire, road-making, tree-felling, limitations, tax registration, reporting deaths, grass-burning, the killing of game and other administrative matters" (Chanock 1985: 108). In practice, however, chiefs' autonomy was constrained by the government's power of appointment, veto and rule-making (Cammack et al. 2009).

Between 1953 and independence in 1964, District Councils were established as a unit of local government, of which chiefs became *ex-officio* members (Chiweza 2007). The fear that District Councils would promote anti-colonialism motivated the removal of District Councils' powers under the 1954 *Local Government Act*, although their powers were reinstated under the 1961 *Local Government Ordinance*, which also required District Councils to be staffed with elected officials, with chiefs continuing as *ex officio* members (Cross and Kutengule 2005). The colonial government's rationale was that Malawi required a democratic local structure as it became independent. Thus, following the transfer of power to District Councils at the closing stages of British rule, the autonomy chiefs acquired during the colonial era was significantly reduced (Cammack et al. 2009).

The role of chiefs in the colonial era differed from Mozambique, where chiefs were subsumed into a command-and-control system of local prefectures, and from neighbouring countries to the west, where urbanisation, large-scale settler farming and mining activities displaced the authority of the chieftaincy in favour of local governments or centralised control (Cammack et al. 2009).

Chiefs in the post-independence era

After independence during the one-party era (from 1964 to 1992), the new government led by the Malawi Congress Party (MCP) under the leadership of President, Kamuzu Banda, emphasised 'traditional' values, giving chiefs a clear role in government and local affairs (Forester 1994; Kalinga 1998). The enactment of the 1967 *Chiefs Act*, still in force, replaced the Native Authority title with that of Traditional Authority (TA) and established their jurisdictions, but curtailed chiefs' roles to customary law and general welfare under the DC (Cammack et al. 2009). Section 7 of the *Chiefs Act* specifies the roles of chiefs:

- To preserve the public peace;

- To carry out the traditional functions of his office under customary law in so far as the discharge of such functions is not contrary to the Constitution or any written law and is not repugnant to natural justice or morality;
- To assist in the collection of tax;
- To assist in the general administration of the District in which his area of jurisdiction is situated and for such purpose to carry out such functions as the District Commissioner may require; and
- To carry out and enforce any lawful directions of the District Commissioner (GoM 1967: 6-7).

President Banda strengthened central control through amendments to the *Local Government (District Councils) Act* in 1966, which allowed him to appoint Local Councillors and dissolve the power of District Councils (Cammack et al. 2009). In 1967, a parallel structure of District Development Committees (DDCs) was established under the direct control of the Office of the President and Cabinet (OPC), with lower-level Area Development Committees (ADCs) and Village Development Committees (VDCs) chaired by chiefs (Kaunda 1999). While chiefs were incorporated into the government structure, they also succeeded in negotiating enough space to retain their social legitimacy. As Cross and Kutengule (2005) explain,

> "From the chiefs/sub-chiefs level to the households there is a diffuse and horizontal structure that emphasizes a strong network of local cohesion and feedback mechanisms….This suggests that, despite the vertical relationship to the OPC, the Traditional Authority structure has inbuilt mechanisms for voicing and channelling local demands and needs based on strict traditional royalty and socio-cultural affinities and defined roles of the subjects" (ibid: 13).

However, the power of lower-level chiefs was radically altered under the one-party system, which demanded the loyalty of chiefs up the chain of command (Kaspin 1995). While the power of chiefs over customary land did not change, their ability to oppose state imposed projects and the conversion of land into ownership and commercial uses by political elites was curtailed (Cross and Kutengule 2005).

Chiefs in the multi-party era

Chiefs in Malawi, like many other former African colonies, experienced a resurgence following the introduction of the multi-party system in 1994, when Bakili Muluzi won the presidency (Chiweza 2007; Eggen 2011). Eggen (2011) attributes several recent changes to this

development. First, the adoption of the Decentralisation Policy in 1996 under the *Local Government Act* of 1998 has not been implemented effectively in either urban or rural areas, meaning that initiatives intended to curtail the power of chiefs in favour of locally elected councillors have widely failed (see Chiweza 2007). The situation has been exacerbated by the extended periods of time between 1994 and 2000 and between 2005 and 2014 when there were no elected local governments in the country, allowing chiefs to become *de facto* leaders (Chinsinga 2015). In the absence of strong and elected Local Councils, DCs and DDCs continue to play a strong role in local planning and decision-making, with chiefs often taking the lead (Cross and Kutengule 2005). Second, weak administrative capacities at the local level have made it is extremely difficult for officials to interact with villagers except through chiefs, reinforcing their role as gatekeepers. Few government, NGO or donor projects can proceed without chiefs' approval. Third, donor policies tend to target chiefs because they are perceived to be closest to the community and its only representative, even though the chieftaincy is an institution that is unelected and unaccountable to its subjects. Lastly, the social legitimacy of civil servants has declined considerably following the 'culture of fear' propagated during Banda's rule, which was replaced by a culture of 'freedom' (*ufulu*) that included disrespect for officials. Eggen (2011) argues that these changes have supported the 'de-traditionalisation' of chieftaincies, "as the relative balance of 'traditional' functions versus chiefs' role in modern governance has shifted toward the latter" (ibid: 323).

Despite the increasing autonomy of chiefs, recent legislative reforms have sought to curtail their authority over land, where much of their power is vested. For instance, provisions in the new *Land Act* of 2017, under the 2002 National Land Policy, encourage customary land holders to voluntarily obtain titles and register their land as 'customary estates', ostensibly removing some of the power chiefs have over the sale of land, although chiefs would still control the land titling process, including record keeping (field notes, 2017). One chief in Karonga Town explained the situation prior to the passing of the Land Bill in June 2017:

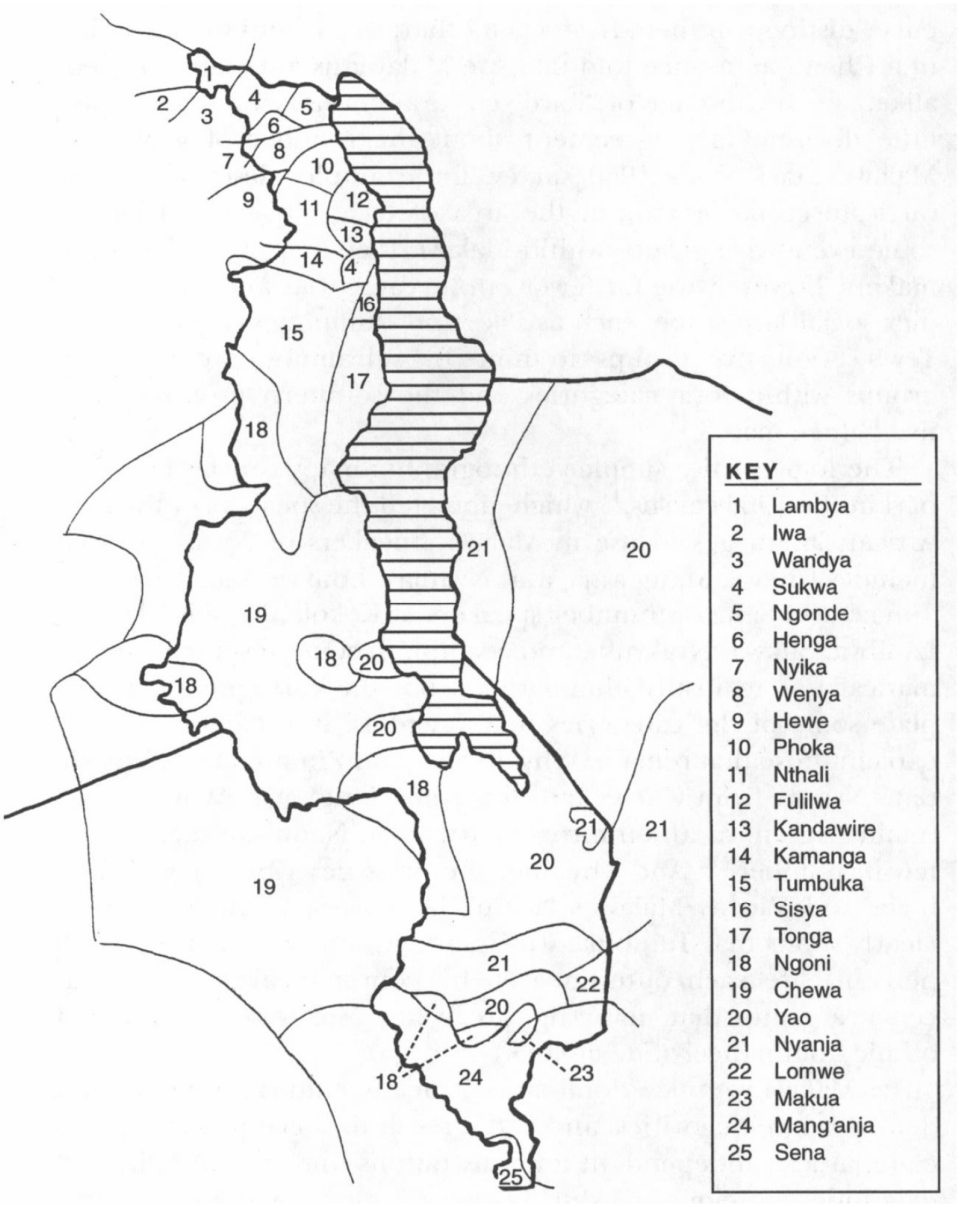
> "I think there will be a problem. I think you have been reading the papers, and you heard Paramount Chief from Mzimba. He said 'no land bill here, this is our land'. The problem was that there was no consultation from the ground. We knew nothing about it. It is a law, but it will have a political conflict. You know it can become a law and never practiced. And on political terms, someone becomes unpopular, and if he wants to impose this, it becomes unpopular. So in most cases it doesn't work. It's not on the ground, we don't even know it" (Interview 4, 21 February, 2016).

At the same time, liberalisation and urbanisation have been accompanied by decreasing respect for 'traditional' values, including customary authority (Poeschke and Chirwa 1998; Jentzsch 2005; Cammack et al. 2009). Even so, chiefs continue to play key roles in land allocation and governance in Malawian towns and cities in the absence of sufficient state capacity and legitimacy (Cammack et al. 2009; Chinsinga 2015), as discussed below.

The current chieftaincy structure

There are different kinds of chiefs within each of Malawi's ethno-linguistic groups and regions. The northern part of the country is dominated by the Tumbuka and to a lesser extent the Henga, Sukwa/Ndali, Tonga and Ngonde, the latter of whom constitute the major group in Karonga Town and other parts of Karonga District. In the Central Region are the Chewa and the Maseko Ngoni, while the south is populated by the Mang'anja, Nyanja, Sena, Yao and Lomwe (Figure 5.10). The Ngonde of Karonga organise themselves in a hierarchical and centralised structure, which differs from other groups, such as the Tonga of Nkhata Bay, who are organised around loosely based clan governance (Power 2010).

Figure 5.9: Ethnic groups of Malawi



Source: Adapted from Tew (1950) by Kaspin (1997)

Malawi's chieftaincy structure is defined by the *Chiefs Act*, which establishes chieftaincies as hereditary and hierarchical (Cammack et al. 2009). At the top of the hierarchy are Paramount Chiefs (PCs) or TAs (where there are no PCs), who are represented within all ethno-linguistic groups and regions. Below the PC/TA level are sub-TAs (STAs), Group Village Headmen (GVH), and Village Headmen (VH), all referred to as chiefs by Malawians (Table 5.3). All villages have a VH under one GVH, and all chiefs have a group of councillors who are usually relatives or close acquaintances. While chiefs are hereditary, the Chiefs Act gives the OPC the power to approve or decline new chiefs and to create new chiefs and TAs (ibid).

Table 5.3: Hierarchy of chiefs in Malawi

Title	Number (as of 2009)	Remit and description
Paramount Chief	7	Oversee all TAs of their ethnicity. In some cases, this relationship is strong, while in others the role is more symbolic and individual TAs do not necessarily look to their Paramount
Traditional Authority	171	Oversees Group Village Headmen. In many cases, assistant senior TAs have been created
Group Village Headmen	2,400	Oversees an average of about eight village headmen, although the number varies considerably
Village Headman	Over 18,000	Serves as the chief of the village. The number of group village headman and village headman positions has increased significantly in recent years

Source: Cammack et al. (2009)

Although chiefs have established authority in rural areas, their status in urban areas is much less clear (Cammack et al. 2009; Chinsinga 2015). Both the *Chiefs Act* and the *Local Government Act* do not recognise the authority of chiefs in urban areas. Conversely, the *Town and Country Planning Act* of 1991 recognises the authority of chiefs to allocate customary land in Statutory Planning Areas so long as titles are acquired and layout plans followed, although the declaration of a planning area does not inherently change the legal status of land or the authority over it (Ministry of Lands, Housing and Urban Development 2015). This ambiguity makes it difficult to discern the *de jure* and *de facto* authority of chiefs in urban areas, often placing them at odds with Local Councils (Cammack et al. 2009). Town chiefs nevertheless control large amounts of urban land in the country, particularly in Zomba and Mzuzu, where customary land dominates all available urban land at 91% and 75%, respectively (UN-Habitat 2010c).

Customary land constitutes one of three land tenure systems in the country, which also include public and private land. Public land is defined as that which is occupied, used or acquired by the government, while private land is defined as that which is held under freehold or leasehold title In contrast, customary land is held or used under customary law, which varies throughout the country depending on the rules and norms of the dominant ethnic group. Even so, customary law is generally flexible and responsive to local socio-economic and demographic circumstances (Liuma 1998; Msisha 1998; Kishindo 2004). There are also common aspects of customary law, namely that land is viewed as a gift from God to communities for their subsistence, land belongs in lineages (kinship is the main factor determining access to land), and land is held in trusteeship for communities by chiefs, who can allocate land, but cannot own it (Msisha 1998).

With urbanisation, customary land markets have begun to commercialise as land pressures have mounted (UN-Habitat 2010). Chome and McCall (2005) draw on Durand-Lasserve's (2003)

concept of 'neo-traditional customary practices' to describe this process in Malawi, where customary/informal land tenure systems have proven far more effective at delivering land for housing to the urban population, particularly the urban poor, than formal systems, as demonstrated by the large share of the urban population living informal settlements, estimated at 60-70% (Manda 2013). Durand-Lasserve (2003) distinguish neo-customary systems from informal systems on the basis of property status: access to customary land is a 'right', whereas access to informal land is monetised. While data on the three main land tenure systems (public, private and customary) are unavailable for all urban centres in the country, customary land is likely to be more prevalent at the bottom of the urban hierarchy, where existing land is held principally under customary law.

Recent efforts to reduce the authority of town chiefs included a proclamation made in July 2015 by the former Minister of Local Government and Rural Development to disband town chiefs in line with the *Local Government Act* of 1998, but it was overturned by the President following widespread protests by town chiefs (Chinsinga 2015). Their continued role in urban land allocation in Malawi, among other sub-Saharan African countries (such as Uganda), has been blamed for the creation of dysfunctional land and housing markets, ineffective development control, and the resulting 'explosion' of informal settlements (Chome and McCall 2005; Yeboah and Shaw 2013).

'Town chiefs' in practice

The role of 'town chiefs' in Malawi are under-studied, despite widespread acknowledgement of their involvement in land allocation, social functions (particularly funerals) and decision-making (UN-Habitat 2010; Chinsinga 2015; Ministry of Lands, Housing and Urban Development 2015). Two studies have helped to fill this gap. The first by Cammack et al. (2009) drew on interviews with key informants (including chiefs, local officials and ministers) to examine the role of town chiefs in 14 urban centres in Malawi, including Lilongwe, Dowa, Ntchisi, Kasungu, Balaka, Blantyre, Zomba, Mponela, Mzuzu, Rumphi (and Bolero), Mzimba, Nkhata Bay, and Karonga Town. The study sheds initial insight into the characteristics of chiefs in urban settings, including their:

- ***Titles***: Town chiefs are called a variety of other names, including, 'captains', 'block leaders', 'local leaders', 'group village headmen';
- ***Status:*** Some town chiefs are not hereditary chiefs or formally recognised by government under the *Chiefs Act*, while others have formal power and are paid an honorarium by the government;

- ***Prevalence***: Town chiefs reportedly administrate larger than comparable numbers of people in rural chieftaincies, including one town chief in Karonga Town who claimed to have more than 6,000 people in his area;
- ***Profile***: Town chiefs are typically chosen for being 'hard working', 'respectable', of 'good standing'. Many are among the local elite, including homeowners, civil servants, civil society leaders, businessmen;
- ***Functions***: Town chiefs preside over:
    - *Cultural affairs* (e.g. sickness, birth, death, marriage, protecting communities from witchcraft, caring for the poor, upholding peace);
    - *Administration* (e.g. participating in village development committees, attending local assembly meetings, collecting funds from the community for local projects, distributing government subsidies, working with NGOs and donor organisations);
    - *Land and property allocation* (although town chiefs do not have powers to allocate urban land under the *Chiefs Act*);
    - *Justice and order* (e.g. settling disputes, dealing with theft land conflict, adjudicating disputes between community members);
    - *Politics* (e.g. being used by politicians to attract voter support, running for elected office);
    - *Social and economic development* (e.g. providing the link between government and NGO projects and communities).
- ***Relationships***: Working with officials and Members of Parliament (MPs) in local development committees;
- ***Motives and incentives***: Town chiefs do not receive a wage from local government (except for those who are recognised as hereditary chiefs) and so are dependent on payments (in money or kind) from community members who accept the value of their services and presence, although some chiefs only ask for good will in return; and
- ***Accountability, authority and legitimacy***: Few town chiefs are subject to re-election, with some exceptions, while in some cases they can be removed and re-appointed; their authority differs depending on their degree of recognition by the community and the authorities; and they can punish subjects who are disobedient.

Cammack et al. (2009) make three important conclusions: First, that town chiefs are a form of hybrid local governance that emerged from the historical process of state formation; Second, that town chiefs cannot be equated with 'traditional' social norms since they have adapted to urban conditions, including the absence of state recognition; and Third, that towns chiefs help

communities to overcome collective action problems by bringing together disparate groups and imposing rules that allow communities to gain access to public goods. The cost, however, is a local governance system that is antithetical to the liberal democratic ideals that the formal state has committed to.

The second study by Eggen (2011) drew on participant observations of informants (including local residents, chiefs and officials) to examine the nature of the dual state in Malawi using Zomba and surrounding rural villages as case studies. Her analysis indicates that while the dual character of the state persisted during the independence and multi-party eras, despite major reforms, as discussed above, the boundaries between customary and state institutions have become increasingly porous. This change is attributed to the diffusion of modern, direct forms of rule into rural areas without eliminating chiefs' authority, meaning that individuals are simultaneously citizens and subjects.

While Eggen's work emphasises the hybrid nature of local governance, as does Cammack et al. (2009), her analysis did not fully explore how the process of urbanisation is working to destabilise the rural/urban axis traditionally used to distinguish customary (rural) institutions from modern (urban) institutions by motivating the latter to penetrate peripheral areas. In the Northern Region of Malawi, low urbanisation levels mean that the in situ growth of small settlements are likely to bring existing chieftaincies, who are most probably hereditary, into contact with modern institutions seeking to incorporate emerging populations into planned townships. The case of Karonga Town demonstrates how this process can result in conflicts between customary rules and norms inherited from rural ways of life and modern rules and norms inherited from direct rule, of which urban planning played a key part, as discussed in Chapter Ten (section 10.2). The case contributes to a better understanding of the changing nature of local governance in urbanising rural territories and the implications for evolving efforts to plan Malawi's urban transition at the bottom of the urban hierarchy.

5.2 Understanding Karonga Town's urban trajectory

Zooming to the urban scale, this section provides a discussion of the factors shaping Malawi's urban transition that are also influencing Karonga Town's urban trajectory, with a focus on urban growth and development dynamics, geographic and climatic conditions, the economy, socio-economic conditions, and local governance. Particular attention is paid to how the process of in situ urban change is creating new local governance challenges for the urban planning system as it encounters existing chieftaincy structures, resulting in mounting conflicts that threaten to undermine the planning system in spite of the town's rapid growth.

5.2.1 Urban growth and development dynamics

The origins of Karonga Town can be traced back to the 1880s, when Mlozi, a Swahili slave trader, established a slave trading post in the Kambwe area, about 8 kilometres north of the town's present location (Kalinga 1980). From Kambwe, Mlozi conducted raids on villages to capture slaves for shipment to the port of Bagamoyo to the north of Dar es Salaam. An effort to intervene by the African Lakes Company (ALC), a Scottish trading interest, which had also established a trading centre at Kambwe, led to a prolonged war (referred to as the 'Arab War' or 'Karonga War') between the ALC and the Swahili traders. The war continued from 1887 to 1895, when Mlozi was captured (ibid).

Karonga Town's growth was bolstered when Scottish missionaries established what is known today as the Church of Central Africa Presbyterian (CCAP) in 1891 (Manda et al. 2016). The British Colonial Administration, which also arrived in 1891, established a British Overseas Military Area (BOMA[8])—in which District Councils were initially located—at Kambwe in 1895 before moving it to the present settlement in 1904. The town's development was interrupted in 1914 when a battle erupted between British and German troops patrolling the waters of Lake Malawi (then Lake Nyasaland), marking the beginning of World War I (ibid).

Following the war, the town's growth was spurred by several developments, including the construction of the town's first hospital in 1931 (the current hospital was constructed in 1985), an airfield in 1947 (the current airport was constructed in 1967) and St Mary's Secondary School in 1955 (Ministry of Lands and Housing 2013). Other important developments included the establishment of the Karonga Agricultural Development Division (KRADD), the Karonga Teachers' Training College (TTC), the Cultural Centre and Museum, and the Northern Corridor Transport Route to Dar es Salaam (ibid).

In 1959, frequent out-bank river flooding in the Kambwe area combined with its narrow harbour led to the town's relocation to the area along the lakeshore known today as 'old town' (Manda et al., 2014). Much of this area was destroyed by a major flood in 1979. The District Council and the commercial centre were subsequently shifted to the southeast by approximately two kilometres to avoid flooding, although the town centre is now exposed to seasonal floods in the absence of effective planning and drainage (Manda et al. 2016). Efforts to reduce flood risk were supported in the 1980s under the German-funded Karonga Flood Control Measures Project

[8] BOMAs remain a common term for urban centres home to District Councils in Malawi.

(KFCMP), which constructed the dyke and the drainage channels, but they have not been properly maintained, as discussed in Chapter One (section 1.2).

Despite the development of Karonga Town and other urban centres (notably Mzuzu) in the North, the region was viewed as the 'dead north' until 1988, when the M1 Road, referred to later as the 'Northern Corridor', was extended to the Tanzanian border at Songwe (McCracken 2003; Manda et al. 2016). The extension of the M1 positioned Karonga Town as the first major urban centre and stop over point between Malawi and Dar es Salaam, as reflected by the many rest houses and filling stations that have emerged (Figure 5.11).

Figure 5.10: One of four filling stations in Karonga Town

Photo credit: Author (2017)

Since 1966 (the first census year), the town's population has grown nearly four-fold from 11,242 to 41,074 in 2008 (the last census year) (NSO 2008). Planning was, however, slow to respond. In 1987, the National Physical Development Plan (NPDP) was prepared with the aim of achieving a decentralised pattern of urbanisation through the establishment of rural growth centres, including Karonga Town (Manda 2013), as discussed in Chapter Six (section 6.1). The Karonga District Development Plan (KDDP) was subsequently prepared in 1991, which called for Karonga Town to be declared a sub-regional service centre under the NPDP and for a detailed urban structure plan to be prepared to guide its development (Ministry of Lands and Housing 2013).

In that year, Karonga Town was declared a Statutory Planning Area under the *Town and Country Planning Act* of 1988 (Ministry of Lands and Housing 2013). In 2003, the Karonga Town Planning

Committee prepared the first urban structure plan, which was adopted in 2006. Although the plan had a life-span of 10 years and was due for revision in 2016, it was replaced in 2013 by the Karonga Urban Structure Plan following the 2009 earthquake and 2011 flood disasters (ibid), as discussed in Chapter Nine (section 9.1.3). Among the plan's major objectives was to redirect urban growth away from hazard-prone areas by extending the town's administrative boundary to the south east away from the North Rukuru River. However, the plan has not been implemented in the absence of a functional and elected Town Council, which was dissolved by national government in 2005 (Manda 2014), as discussed below. Several recent development projects demonstrate the ineffectiveness of the planning system and related impacts on the urban environment:

Illegal development in drainage channels

Numerous private developers have illegally erected structures (lodges, housing, rice mills) adjacent to drainage channels and formalised them retroactively by acquiring titles from the Ministry of Lands (field notes, 2017). One of the first illegal developments was a lodge located within a short distance of the District Council offices (Figure 5.12). Although its owner was given a stop notice when constructing the foundation, it was never enforced. According to the current Lands Officer, who is familiar with the case, though was not involved, the stop notice was not enforced because the developer claimed his family owned the land and so threatened to take the District Council to court (Interview 7, 24 April 2017). However, the District Council would have had to acquire the land required for the drainage channel for public use during the planning process (as permitted under the *Lands Acquisition Act*). Thus, the land owner would have had no legal case to bring against the District Council.

Figure 5.11: One of the first illegal developments (pictured left) built adjacent to drainage channels, Malema 2

Photo credit: Author (2016)

In failing to enforce the stop notice, the District Council set a precedent for the many illegal developments to follow. In effect, any developer who manages to illegally construct a building in or near the drainage channel can now formalise their development by registering their plot with the Ministry of Lands, flying in the face of planning regulations. That nothing was done to protect the drainage channel, and the critical environmental function it performs, raises serious questions concerning why the Council chose not to enforce planning regulations, despite the effect it would have on future enforcement and the ambiguity it would create concerning what is legal and illegal, authorised and unauthorised. In choosing not to enforce the regulations, the District Council itself acted informally. While planners and other officials commonly blame informal/illegal developments on chiefs and other informal actors (including low-income groups), the government is itself complicit in the creation of 'informality' and related environmental hazards.

Illegal developments in flood plains

The District Council has circumvented land use planning regulations to enable the construction of public facilities in hazard-prone areas. In Kafikisila village, the chiefs asked their Member of Parliament (MP) to lobby the District Council for a primary school given the Council's unwillingness to act. As the Village Development Committee (VDC) chairmen explained:

> "There was a cry because of the distance [our children had to walk] so our village headmen sat down and we wrote a letter [to the District Council] asking about the primary school. They accepted us, and we sat down to mould bricks. And now as I am talking there are two [school] blocks…" (Interview 11, 21 February 2017).

The land for the project was acquired by the community, surveyed by the Ministry of Lands, and financed by the District Council through the Local Development Fund (LDF)—a finance mechanism that channels national funds to Local Councils to support locally identified, planned and managed projects (field notes, 2017). However, no environmental assessment was undertaken, even though the site is located in the middle of a large dambo (marsh) in the North Rukuru River flood plain (Figure 5.13). The flood in 1979 badly damaged the area. The 2013 Urban Structure Plan, which designates the area for urban agriculture (the school is surrounded by rice paddies) and is within the flood boundary, was also ignored. From a planning perspective, the school is therefore a legal non-conforming land use.

Figure 5.12: Primary school under construction in Kafikisila village

Photo credit: Author (2017)

As in the case of the illegal development in the drainage channel, the District Council and the Ministry of Lands acted informally by ignoring planning regulations. It could be argued that the District Council and the Ministry of Lands acted irresponsibly given the school's location in a flood-prone area, potentially putting children in harm's way. In such cases where projects are influenced by community pressures, regulatory enforcement may depend more on the political will of decision-makers rather than on the technical capacity of planners. Regulatory enforcement is therefore determined in large part by the political bargaining environment in which decision-makers decide which regulations to enforce, and which to not, regardless of risk.

Development next to drainage channels

Much of the maize and nearly all the rice produced in Karonga District is processed and distributed in Karonga Town. While various rice and maize mills have emerged, most have been constructed in inappropriate places, including adjacent to homes and drainage channels. Consequently, mills contribute to environmental hazards linked to the accumulation of organic waste (particularly rice husks) in residential areas (Figure 5.14), potentially leading to respiratory diseases, and the siltation of drainage channels, intensifying flood risk (Figure 5.15).

Figure 5.13: Rice mill (pictured right) located adjacent to a residential area

Photo credit: Author (2017)

Figure 5.14: Rice mill located adjacent to a drainage channel

Photo credit: Author (2017)

The accumulation of rice husks in the photographs above represent potential hazards for children. Dust from the husks makes the sloped surface of drainage culverts slippery, attracting

children who use it as a slide, exposing them to liquid and solid waste and injuries from falls and cuts (Figure 5.16).

Figure 5.15: Rice mill located next to a drainage culvert in the town centre

Photo credit: Author (2017)

Developments contributing to congestion and safety concerns

A recent market expansion project was supported by Karonga District Council in response to growing demand for stalls. Physical planners did not approve of the project because it contributed to various risks, including road traffic accidents due to its proximity to a busy road, market fires due to its construction over a designated evacuation area, and environmental health impacts due to the added pressure on solid waste management and drainage (Figure 5.17 and 5.18). While physical planners made written statements against the project, the District Council granted approval given the perceived economic benefits (Interview 14, 8 August 2017).

Figure 5.16: Encroachment of new market stalls on a congested road, Karonga Town

Photo credit: Author (2017)

Figure 5.17: Added pressure on drainage from new market stalls

Photo credit: Author (2017)

Developments threatening water safety

Paladin is an Australian mining company that operated a uranium mine at a site outside the town in Kayelekera. Under the banner of corporate social responsibility, Paladin decided to construct a water treatment plant to address Karonga District's overburdened water-supply system. Two committees were formed: a Technical Committee tasked with resolving project-related issues; and a Steering Committee tasked with garnering the support of chiefs and politicians (Interview 8, 04 August 2016).

The company complained that the project was taking too long to plan and pressured for the process to be expedited. A plan was quickly prepared and presented to the Technical Committee and subsequently approved, but without consulting either the Steering Committee or the Town Planning Committee. Paladin reportedly assumed that the plan had the approval of the Town Planning Committee because it was approved by the Technical Committee. The plan did, however, have the political approval of District Councillors who were highly tempted by the size of the investment, according to one Northern Region Water Board (NRWB) official (Interview 8, 04 August 2016).

In bypassing the Town Planning Committee, serious errors were made in siting the facility. The plant was located on the shores of Lake Malawi, exposing the facility and its intake pipes to strong winds and tidal currents (the intake pipes were damaged by tidal currents shortly after construction). The NRWB initially wanted the site to be located around 30 kilometres south near Mikoma Beach Lodge, where the plant would have had a natural windscreen. However, the lodge was owned by a MP who did not want the facility located there.

Ironically, the plant was located in front of Club Marina, a popular beach lodge in Karonga Town, blocking its view (Figure 5.19). Due to the negative impact on Club Marina's business, its owner took the District Council to court. However, since the owner did not legally own the land in front of the lodge, the case was dismissed. Paladin proceeded to contract engineers from South Africa to design and construct the facility, but without considering the local appropriateness of the technology. Consequently, the expensive membrane filters that were chosen were unable to be replaced due to their cost and scarcity. To ensure the water remains safe to drink, daily samples are taken, but there are no testing facilities in Karonga Town or the District. The samples are transported to a lab in Mzuzu, creating a lag time when the tests are taken and the results received. It is plausible that water contamination caused by damage to the facility would not be detected quickly enough, putting the population at risk of water-borne diseases.

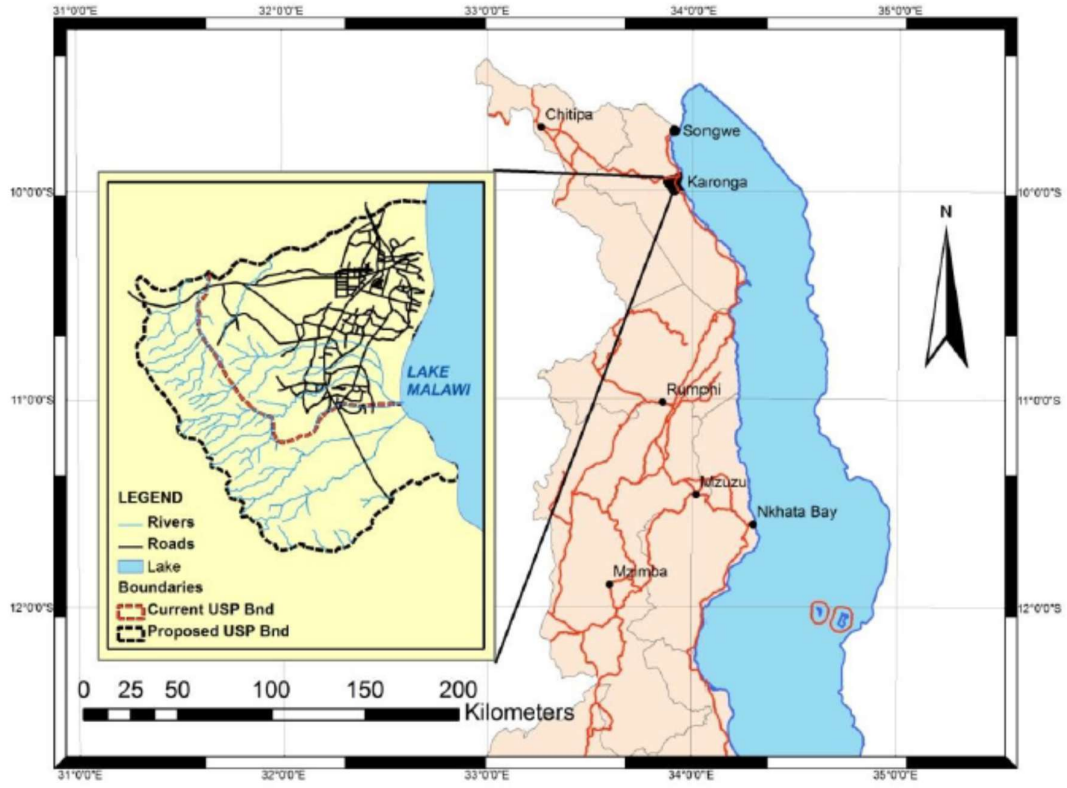
Figure 5.18: View in front of Club Marina obstructed by the Karonga Water Plant

Photo credit: Author (2017)

5.2.2 Geographic and climatic conditions

Karonga Town is located in the Karonga lakeshore area on the North Rukuru River flood plain, approximately 200 kilometres north of Mzuzu and 40 kilometres south of the Tanzanian border at Songwe (Figure 5.20). The town's current Statutory Planning Area comprises 4,386 hectares and ranges in elevation from 447 metres to 500 metres above sea level (Ministry of Lands and Housing 2013). The lakeshore area and river flood plains are dominated by woodlands of baobab, palms, eucalyptus, Acacia and other exotic species, although most vegetation has been removed to make way for agriculture (namely rice, maize, cassava and bananas) and urban development (ibid; field notes, 2017).

Figure 5.19: Location and context map of Karonga Town



Source: Ministry of Lands and Housing (2013)

Historically, favourable environmental conditions in the Karonga lakeshore plain, notably its soil fertility, high precipitation, and proximity to year-round water supplies from the North Rukuru River and the lake, enabled the Ngonde tribe to develop a relatively stable agricultural economy and society, positioning the area as among the most developed in the northern reaches (Kalinga 1985). The area remained isolated from the rest of the country until 1981, when the M1 road was extended from Mzuzu to Karonga Town and north to the Tanzanian border at Songwe, contributing to the town's growth as a trading centre (field notes, 2017), as discussed above.

Due to Karonga Town's location in the northern part of Karonga District, its climate is hot, with a mean annual temperature of 24 degrees Celsius, and markedly wetter than in the south of the District, reflected in differences in agriculture, vegetation and disease prevalence, with schistosomiasis, filariasis and leprosy being more common (Crampin et al. 2012; Ministry of Lands and Housing 2013). The town's growth in the North Rukuru River flood plain and location in the East African Rift Valley also heightens its exposure to floods and earthquakes, while the lack of effective urban planning has exacerbated the town's vulnerability to these and other risks, which encompass a wide spectrum, ranging from infectious and parasitic diseases, to road traffic accidents, to various natural disasters (Manda 2014; Manda et al. 2016; Manda and

Wanda 2017), as discussed in Chapter One (section 1.2). The risks that these hazards pose to environmental health are elaborated throughout Chapter Nine.

5.2.3 The economy

Karonga Town—alongside Kasungu, Mangochi, Salima, Liwonde, Bangula and Dedza–is designated as one of seven sub-regional service centres under the National Physical Development Plan (NPDP) of 1987, which serves as Malawi's de facto urban policy[9], signifying the town's socio-economic importance in Malawi and the Northern Region, in particular. Karonga Town performs a wide range of functions in rural and regional development as a centre of administration, service delivery, education, commerce, marketing and distribution, food aid, mobility, communication, culture, and religion:

Administrative centre

- For the Karonga District Council (including the Chairmen of Council, Director of Planning, Public Works, Registration Bureau, and Disaster Program Office)
- For Ministries of Agriculture, Irrigation and Water Development, Agriculture and Food Security, Works, Labour, Lands
- For tax collection by the Malawi Revenue Authority

Service centre

- For the Karonga District Hospital and its outreach centres
- For private health clinics
- For utilities (including the Northern Region Water Board (NRWB) and the Electricity Supply Corporation of Malawi (ESCOM))
- For various Non-governmental organisations (NGOs) and humanitarian agencies

Educational centre

- For nursery schools
- For primary, junior and secondary schools
- For training centres for teachers (including the Teacher's Training Centre or TTC)
- For polytechnic eduction (including the Karonga Polytechnic)

[9] Malawi's first national urban policy remains in draft form (field notes, 2017).

- For libraries (including the National Library Service)

Commercial centre

- For banks (including FMP, FINCA, NBS, FDH, Standard Bank, National Bank of Malawi, and OIBM)
- For numerous rest houses, restaurants, shopping centres, markets, bottle-shops, filling stations, and general stores
- For agriculture, agro-processing activities (mainly rice and maize), fishing, and mineral-based industry, and small-scale industrial activities (mostly informal)

Marketing and distribution centre

- For rice and maize and to a lesser extent timber
- For fish and agricultural produce sold in the market
- For uranium (previously shipped to South Africa when a nearby mine was active)

Food aid centre

- For food aid storage and distribution centre during emergencies, particularly floods, droughts and earthquakes

Mobility node

- For seasonal migrants and immigrants from Tanzania working in trade
- For travellers to and from Dar es Salaam
- For refugees from Burundi, in particular

Communications centre

- For radio stations (including Tuntufye FM Radio Station and Radio Dinosaur 91.0 FM)
- For postal offices
- For cell towers

Cultural centre

- For the Cultural Centre of Karonga
- For the Museum of Karonga

Religious centre

- For various churches of different denominations (including the C.C.A.P. Synod of Livingstonia)
- For mosques of Muslim affiliation (field notes, 2017)

Karonga Town's socio-economic importance has been heightened by recent transformations in trade, transport, and hospitality and tourism, and by its position as major trading centre and town near the Tanzanian border. According to the 2013 Karonga Urban Structure Plan,

> "Commercial activities in Karonga are growing at a fast rate as compared to other urban centres in Malawi. This is attributed mainly to the establishment of the Uranium mine at Kayelekera which has boosted prospects of commercial activities [and] trans-border trade with Tanzania since most traders from Tanzania prefer to sell their merchandise in Karonga due to [its] conducive business atmosphere" (Ministry of Lands and Housing 2013: 17).

A survey by the Ministry of Lands and Housing (2013), undertaken to inform the 2013 Karonga Urban Structure Plan, indicates that at least 60% of the town's economically active population is employed in the informal sector, which is dominated by small-scale activities, such as fishing; automobile repair; blacksmithing; pottery; basket-making; tailoring; timber, maize and rice mills; bicycle taxis; Bicycle taxis are among the most prevalent small-scale activities (Figure 5.21) and so attract a large number of temporary rural migrants seeking piece work in the dry season, signifying the town's role as a mobility node (field notes, 2017).

Figure 5.20: Bicycle taxi stand next to the market in the town centre

Photo credit: Author (2017)

The remaining 40% of the town's population is employed in the formal sector, which is dominated by commercial enterprises, followed by education (the town has 16 primary schools, five secondary schools and two tertiary educational institutions), health (Karonga District Hospital is located in the town), the mining industry (a uranium mine is located 30 kilometres away from the town, although its operations were recently suspended) and policing (Ministry of Lands and Housing 2013). Despite the prevalence of non-farm activities, a large share of the population is engaged in urban agriculture, particularly along the marshy area along the North Rukuru River and the lakeshore, which are extensively cultivated with maize and rice (Figure 5.22). Other agricultural activities include vegetable growing, cattle and goat rearing, and horticulture, as discussed in Chapter Nine (section 9.1.2).

Figure 5.21: Rice paddies around a small stream near the North Rukuru River

Photo credit: Author (2017)

The town has two commercial centres: the old town centre near the lakeshore area and the new town centre at Katali. The old centre was relocated to its present site approximately two kilometres eastward after it was badly damaged by a flood disaster in 1979, as discussed above. The old centre has three markets catering mainly to maize, grain and several retail activities, while the new centre features the largest market catering to a variety of products and services, including grains, legumes, fish, meat, spare parts, tailoring, transport, barbers and hair dressers (field notes, 2017).

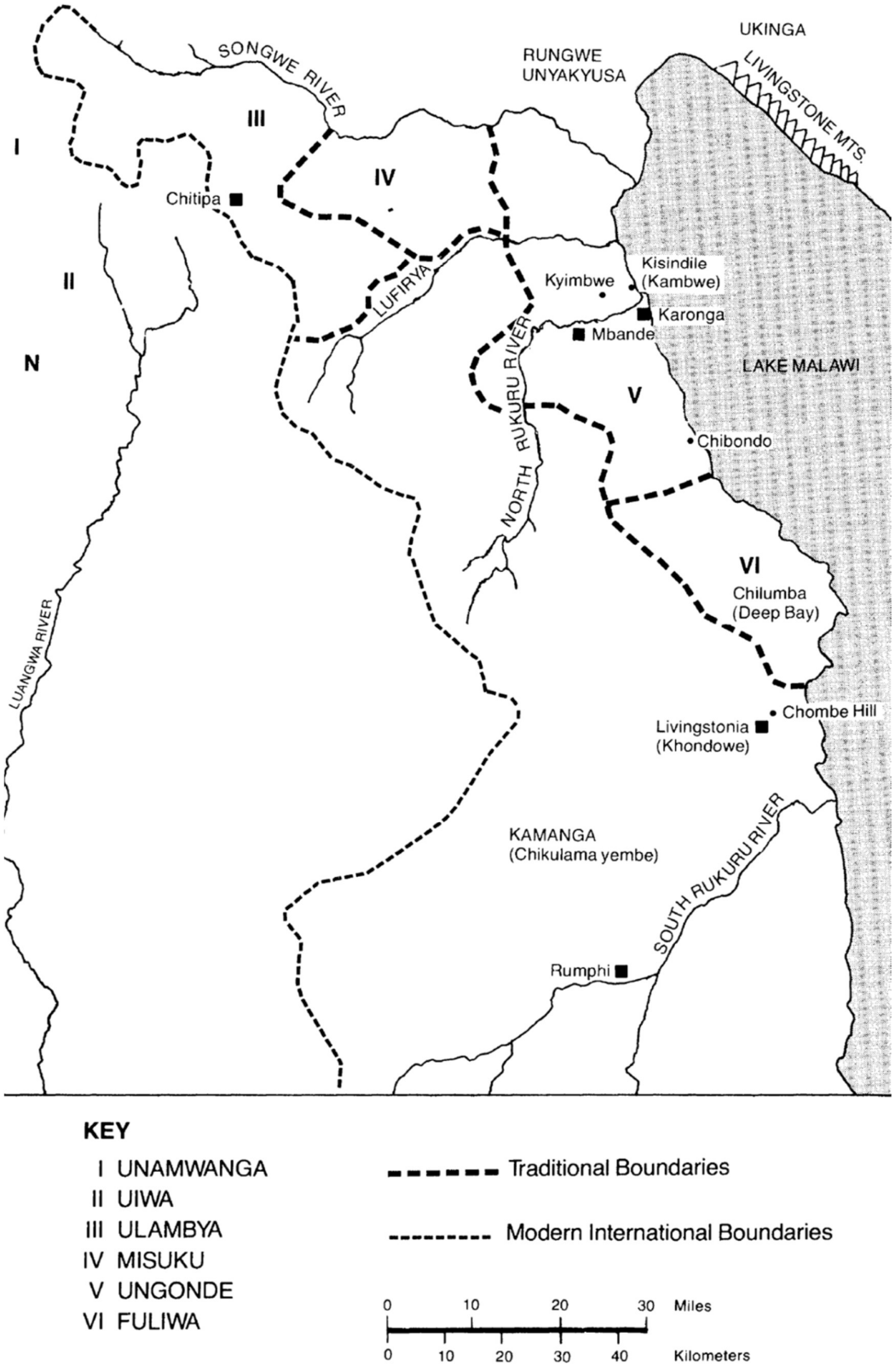
The prevalence of non-farm activities, including various small businesses, indicates that Karonga Town's economy is diversifying, providing an indication that in situ urbanisation is occurring alongside structural transformation. These processes are likely to intensify as the town continues to grow at around 5% per year (NSO n.d.) and develop into a major trading centre. Karonga Town thus has significant potential to contribute to the urbanisation of the North, Malawi's least urbanised and developed region.

5.2.4 Socio-economic conditions

Mbande Hill, located around five kilometres south of Karonga Town's present location (Figure 5.23), was the headquarters of the Kyungus, who ruled the Ngonde of the north from the time they arrived in the area around the turn of the seventeenth century (Kalinga 1980). The Ngonde

emerged as a Kingdom due to favourable environment in the Karonga lakeshore plain, notably its fertile conditions, high rainfall, and proximity to permanent water supplies from the lake and North Rukuru River (Kalinga 1979), as discussed above. These conditions enabled the Ngonde to develop agriculture (notably maize, millet, cassava, beans and rice) and fishing as the backbone of their economy, to emerge as a relatively stable and self-sufficient society, and to establish a centralised political system dominated by the Kyungus (ibid). These conditions similarly influenced Swahili traders to set up camps in the Karonga plain, including one at Kambwe, where the Karonga BOMA was initially established by the colonial administration (Kalinga 1985), as discussed above.

Figure 5.22: Northern Malawi around 1700



Source: Kalinga (1979)

Today, the Ngonde people, alongside various Tumbuka-speaking groups, remain the dominant ethno-linguistic group in Karonga Town and its surrounding area, despite increasing in-migration from other areas and countries (notably Tanzania). The Ngonde continue to practice many of their cultural traditions, notably cattle-keeping as a status symbol and source of capital and food, and the burial of deceased family members in nearby graveyards viewed as sacred sites (field notes, 2017).

At the same time, however, living conditions have deteriorated significantly as Karonga Town has grown without effective urban planning, as demonstrated by the proliferation of semi-permanent and traditional (unplanned) settlements, which account for over half of the population in the old town boundary (Manda and Wanda 2017). Sanitary conditions are the worst in these settlements, many of which are located in hazard-prone areas along the river, where seasonal floods are common, as discussed in Chapter Nine (section 9.1.3 and 9.1.4).

Household income is generally low, with 30% of the population earning around 10,000 Malawi Kwacha (MWK) (US$ 14) per month (ibid). High levels of income poverty combined with the emergence of a large informal sector present additional risks associated with food insecurity and occupational hazards, also discussed in Chapter Nine (section 9.1.2). Declining socio-economic conditions must therefore be seen in the context of the Northern Region's historical underdevelopment and its late urban transition, posing new challenges for local governance.

5.2.5 Governance

The governance of Karonga Town as an urban centre is not well documented, with the exception of Manda's (2014) study of the challenges linked to the absence of a functional and elected Town Council. This section reviews what is known about local governance in the town based on existing literature and primary data from the ethnographic research.

Decentralisation in Malawi was reintroduced following multi-party elections in 1994, when the *Local Government Act* of 1998, in conjunction with the Decentralisation Policy of 1996, were adopted (Manda 2014). The first local elections were held in 2000, but were discontinued in 2005. The official reason given by the national government was two-fold: Local Councillors were not well educated enough to understand the complexity of local development issues, and insufficient funds were available to hold local elections. Amendments were subsequently made to the *Local Government Act* in 2009 to dissolve all Town Councils (ibid).

No local elections have been held in Karonga Town since the Local Councillors' first term ended in 2005, even though local elections were reinstated in other parts of the country following tripartite national elections in 2013 (Manda 2014). Hence, the town remains without a functional and elected Town Council, meaning its governance structure has been effectively re-ruralised. There is widespread acknowledgment among officials and NGO practitioners of the need for a Town Council to be reinstated given the town's size and growth, but the Minister of Local Government has failed to do so under the *Local Government Act*. Planners familiar with the situation attribute this failure to 'politics' writ large, but were not more specific, despite repeated follow-up questions (field notes, 2017). It is likely that these politics relate to Manda's (2014) argument that Town Councils were dissolved because national politicians view decentralised local structures as unnecessary and Local Councillors as threats to their authority. Whatever the case may be, Figure 5.24 compares the town's governance structure (right side) to the typical urban governance structure in Malawi (left side).

Figure 5.23: Differences in governance structures between Karonga Town and other urban centres

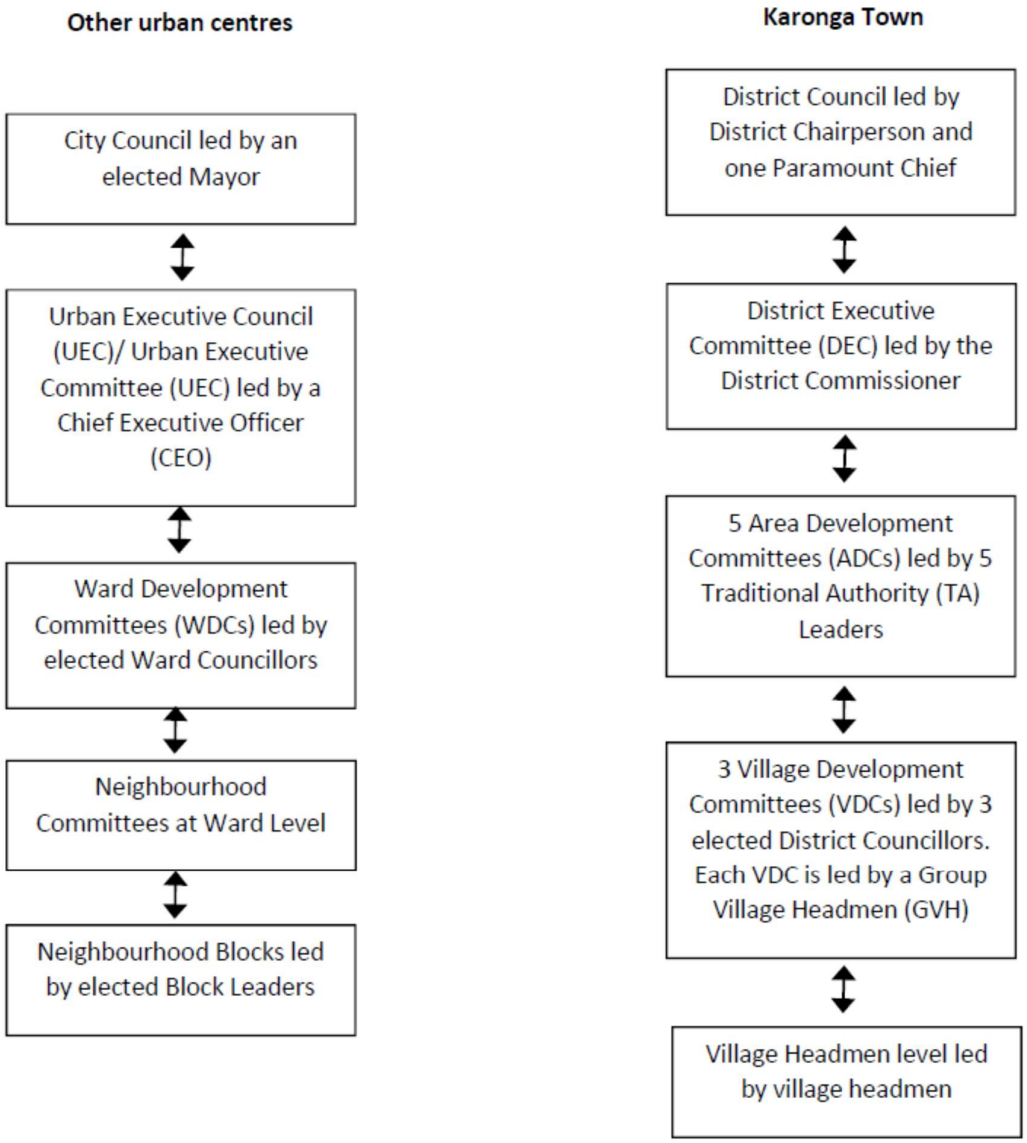


Diagram by author

Physical planners identified several major differences between these structures (field notes, 2017):

- City Councils function as their own Districts, with their own elected representatives (including Mayors and Ward Councillors) and powers to prepare, enact and enforce local

physical development plans[10]. Conversely, Karonga Town was merged with the Karonga District Council when local elections were suspended in 2005. The town therefore has no administrative structure at the urban scale.

- City Councils are headed by elected Mayors who oversee a defined urban jurisdiction (a city/municipality). Conversely, the Karonga District Council is headed by a politically appointed District Chairman who oversees the entire District.
- City Councils govern consolidated spatial areas disaggregated into wards, neighbourhoods and blocks. Conversely, the Karonga District Council governs the entire District, encompassing five Area Development Committees (ADCs) at the Traditional Authority Area (TA) level under one Paramount Chief. The purpose of ADCs is to communicate local needs to the District Executive Committee (DEC), which decides which local development projects to support. Beneath the ADCs are numerous Village Development Committees (VDCs) (urban and rural), each controlled by a Group Village Headman (GVH). VDCs identify local problems and prioritise local development projects, which are then communicated to the ADCs. Karonga Town has one ADC, which includes rural VDCs beyond its administrative boundary.
- City Councils are comprised of Ward Development Committees (WDCs) consisting of neighbourhoods and blocks. Each WDC has an elected ward councillor, each neighbourhood has an elected leader, and each block has an appointed leader. Conversely, Karonga Town is comprised of three VDCs: Mwahimba, Mweninyumba, and Katolola. Each VDC (roughly equivalent to the neighbourhood level) is controlled by a GVH who oversees village headmen at the sub-village level (VDCs are comprised of numerous villages). There are no elected leaders beneath the VDC level and there are only three District Councillors for the town.
- City Councils recognise the mayor, ward councillors and block leaders, but do not recognise chiefs (locally termed 'blood Leaders') who are relegated as *ex officio*

[10] Local physical development plans include: urban structure plans (land use plans for the whole of an urban area); urban layout plans (detailed land use plans for a part of an urban area in which significant physical development is planned or is likely to begin or has begun to take place or there is need for development, redevelopment or upgrading); urban civic plans (more elaborate design of a special area or areas of an urban area showing layout of buildings, car parking lots and landscaping among other details); and subject physical development plans (concerned with a particular subject matter) (Manda 2013). These plans are essentially master plans (i.e. long-range policy documents prescribing the location, use and form of future physical development and relying on regulatory frameworks to implement, namely zoning schemes and building codes and standards (Watson 2009).

members of Local Councils. Conversely, there is no formal government structure below the VDC level in Karonga Town, allowing chiefs to govern semi-autonomously.

- City Councils have their own municipal budgets that ward councillors compete for. Conversely, VDCs in Karonga Town must compete with other VDCs for scarce resources at the District level.

Planners identified various institutional constraints associated with having a rural governance set up for an urban area (field notes, 2017):

- A rural governance structure is inherently less representative, participatory and accountable to urban dwellers. This is in part because (a) City Councils have a more devolved leadership structure at the Ward and city levels, whereas District Councils have a centralised structure at the VDC and ADC levels (encompassing urban and rural areas), and (b) chiefs retain a large amount of power and influence over decision-making at the local level, even though they are not elected and not necessarily accountable, transparent or fair.
- A rural governance structure creates potential for conflict and power struggles between chiefs and District Councillors. The former often have more social legitimacy than the latter.
- A rural governance structure makes it possible for chiefs to undermine the decisions and plans of the District Council, particularly given their role in land allocation. Few formal checks and balances are in place at the local level, particularly in the absence of a regular Town Planning Committee.
- A rural governance structure positions customary institutions as the primary governing entities at the community level. Chiefs uphold customary rules, norms and traditions and serve as the custodians of land, pitting them against formal land management structures, particularly those seeking to take away their power.
- A rural governance structure means that there is no local mechanism to enforce development control, leaving chiefs to manage land as they see fit, despite official rules and regulations.
- A rural governance structure means that the District Council lacks the bureaucratic and fiscal capacity to meet the development needs of the town and respond to the demands of citizens.
- A rural governance structure means there is insufficient local political representation to support grassroots participation in planning and decision-making.

The administrative and political vacuum created by the dissolution of the Town Council allowed chiefs in Karonga Town to reclaim much of their control over land and hence society and governance, as discussed in Chapter Ten (section 10.2). Chiefs are once again the gatekeepers between government and communities, with many serving as *de facto* civil servants in Village Development Committees (VDCs) in the absence of local officials (field notes, 2017). The two parallel structures (chieftaincy and modern government) have subsequently intertwined, resulting in confusion over who has authority and who represents the state.

The contribution this thesis makes to the literature on the role of chieftaincy in local governance is to reveal the conditions in urbanising rural territories that challenge the traditional distinction, as per Mamdani's (1996) typology, between direct rule in urban areas and indirect rule in rural areas. In this context, I argue for an alternative view of governance as multiple and overlapping in order to understand the complex interactions between the different stakeholders involved in decision-making both inside and outside official arenas, and how these interactions vary according to changing local realities linked to processes of in situ urban change. The institutional lens presented in Chapter Three (section 3.1.3) is designed specifically to address this question in Karonga Town, as operationalised in Chapter Ten.

5.3 Conclusion

This Chapter explored Karonga Town's urban trajectory in the context of Malawi's late urban transition and the Northern Region's historical underdevelopment. In this context, Karonga Town's in situ urban growth has led to new local governance challenges as customary (rural) institutions and modern (urban) institutions have intertwined in hybrid structures, resulting in conflicts that threaten to undermine the effectiveness of the urban planning system. Malawi's historically low urbanisation level means that in situ urbanisation at the bottom of the urban hierarchy is likely to account for a large and potentially growing share of future urban growth, particularly in the North as the least urbanised region, making it necessary to understand what these trends mean for emerging efforts to engage in urban planning in rural territories.

Analyses in later Chapters, particularly Chapter Ten, contribute to emerging debates on urban governance in Malawi by exploring the interactions between customary and modern institutions in urban planning *systems* of multiple, competing stakeholders, and by exploring the consequences for the quality of the urban environment and related health risks and outcomes. As a basis for this exploration, the following Chapter attempts to determine more precisely how many people live at the bottom of the national urban hierarchy in both absolute and relative terms. The demographic importance of smaller urban centres has received little attention in

policy and academic circles in Malawi, presenting a timely opportunity for this study to broaden the debate beyond the prevailing focus on the four largest cities.

Chapter 6 Re-visiting urbanisation in Malawi

Malawi's urban transition is underway: the most recent 2008 census indicates that approximately 14% of its population lived in urban areas and that the population is urbanising moderately at nearly 4% per year (NSO 2008). Being at the initial stages of its urban transition presents a timely opportunity to ensure that urban planning in Malawi contributes to healthy towns and cities.

As a starting point, urban policy makers and planners fundamentally require detailed demographic and health information on urbanisation patterns and trends, including urban size distributions. However, such information is lacking in many sub-Saharan African countries for several reasons. First, censuses are often erratic or completely lacking, and where such data exist, their "processing and analysis… is [often] so slow that it is already out of data when published" (Tacoli et al. 2015: 20). In Malawi, however, the processing and analysis of census data is reasonably good; the last 2008 census was published in the same year (NSO 2008) and followed by several analytical reports published in 2010 (for example, NSO 2010).

Second, census data are typically aggregated for individual districts or regions within a given country, but are seldom disaggregated for individual urban centres or presented in a form that is useful for local policymakers and planners (Satterthwaite 2016a). In Malawi, definitions of urban areas are typically limited to the four largest cities (Lilongwe, Blantyre, Mzuzu and Zomba) and 'other cities', which includes secondary centres and rural market centres (both undefined) (see NSO n.d: iii). The use of aggregate statistical categories obscures urbanisation patterns and trends in Malawi, particularly at the lower end of the urban hierarchy.

Third, the criteria used by individual countries to distinguish the smallest urban centres from rural areas are often unclear. This is especially the case when population size criteria are not specified, potentially under-estimating the share of urban population in the smallest centres (Satterthwaite 2016a). In Malawi, it is unclear whether population size criteria are used to distinguish rural market centres from rural areas, leading to confusion concerning whether smaller urban centres are accurately represented within the ambiguous category of 'other cities'.

Lastly, national sample surveys, including the Demographic and Health Survey (DHS), are not representative of populations at the sub-national scale (Montgomery 2009). In Malawi, the DHS is disaggregated for Malawi's three political regions (North, Central and South), all districts and for urban and rural areas. The DHS does not, however, provide disaggregated data for individual

urban centres, since it is intended for use at higher levels (primarily, though not exclusively, national). Nor does the DHS specify its definition of urban areas, making it unclear whether all urban centres, from the smallest to the largest, are accurately represented.

The need for detailed demographic and health information at the urban scale is demonstrated by the evidence reviewed in the first two Chapters indicating that a large and typically growing share of the urban population in sub-Saharan Africa live in smaller centres and that a large share of their populations lack access to basic infrastructure and services (Satterthwaite 2016a). The need for this information is of particular relevance to Malawi given the longstanding national policy aim of slowing the growth of the largest cities through efforts to encourage the growth and development of smaller urban centres in rural areas through local infrastructure and capacity building projects (Manda 2013).

This Chapter does not seek to evaluate the effectiveness of these efforts, which have been provided elsewhere (see Kalipeni 1997; Manda 2013). It rather seeks to provide new insight into the share of the national urban population living in urban centres of different sizes through an analysis of census data, addressing the first research objective:

- To test the hypothesis that smaller urban centres comprise a large and typically growing share of the urban population through an analysis of census data in Malawi.

The following Chapter seeks to provide new insight into inter-urban differentials in environmental health between urban centres of different sizes and locations through an analysis of the 2010 DHS using the urban centres identified in this Chapter as a sample framework. These two Chapters should therefore be read in conjunction. Together, they provide an initial understanding of the demographic and environmental characteristics of smaller urban centres and the implications for population health in Malawi.

This Chapter is comprised of six sections. Section one sets the context by examining the evolution of urbanisation strategies in the post-Independence era based on available literature. Section two critiques the limitations of current urbanisation estimates related to ambiguous criteria used to define urban centres. Section three presents new urbanisation estimates based on the 2008 census data and the new settlement hierarchy. Population estimates are provided specifically for Karonga Town to contextualise its position in the national urban system. Section four discusses the key findings, while section five identifies the limitations of the analysis. Section six concludes. The analysis in this Chapter represents the first time Malawi's urban population has been systematically disaggregated by urban size, raising important new insights

into the share of the urban population living in smaller centres. The main findings are synthesised in Chapter Eleven (section 11.1.1).

6.1 The evolution of urbanisation strategies in Malawi

The process of urbanisation in Malawi began after the arrival of the British Colonial Administration in 1891 and the subsequent development of colonial trading and administrative centres (UN-Habitat 2010). During colonial rule (from 1891 to 1964), the majority of urban investment and infrastructure provision (notably in transport and communications) was concentrated in the Southern Region, where the British established tea and tobacco plantations and the main urban centres of Blantyre, the commercial hub, and Zomba, the seat of colonial government (Kalipeni 1997; Potts 1985b). The colonial government neglected the Central and Northern Regions, the latter of which was referred to as the 'dead north' due to its underdevelopment (Manda et al. 2016). Thus, at independence in 1964, the urbanisation level was around 5%, and 75% of the urban population lived in the three largest cities of Blantyre, Zomba and Lilongwe (Potts 1985a). The rest of the urban population was dispersed in small district centres, trading posts and mission centres in peripheral areas (ibid).

Leaders during the regime of Banda, the country's first post-Independence President (between 1961 and 1994), recognised the rising population and land pressures in the Southern Region caused by the regional imbalance in national development, and employed strategies in an effort to redistribute the population to other parts of the country (Kalipeni 1997). Three key strategies were supported: moving the capital from Zomba to Lilongwe, a purposely planned growth centre located in an undeveloped part of the Central Region; investing in infrastructure in the Central and Northern Regions, including the construction of a paved road along the shore of Lake Malawi between Salima and Karonga Town; and establishing 'growth poles' in predominately rural districts to promote the decentralisation of economic development (particularly non-agricultural employment) and administrative services (ibid).

The third strategy was supported by the Rural Growth Centres Project (RGCP) between 1978 and 1991 with funding from the German Government (Manda 2013). The RGCP supported the development of small markets, water supplies, health centres, schools, craft centres, feeder roads, workshops, abattoirs, workshops and government housing (Ministry of Lands, Housing and Urban Development 2015). Among the project's key objectives was to reduce rural-urban migration through encouraging the growth of smaller urban centres (ibid). By 1987, ten rural growth centres had been established in different parts of the country, including:

- Mkhota in Kasungu District
- Tsangano in Ntcheu District
- Lobi in Dedza District
- Mbalachanda in Mzimba District
- Bolero in Rumphi District
- Likoma, Chizumulu and Chikwina in Nkhata Bay District
- Makanjila in Mangochi District
- Neno in Mwanza District (Kalipeni 1997)

The RGCP was reintroduced in 2005 under the name of the Integrated Rural Development (IRD) programme. New rural growth centres targeted by the programme included:

- Nthalire in Chitipa District
- Nambuma in Lilongwe City
- Jenda in Mzimba District
- Malomo in Ntchisi District
- Monkey Bay in Mangochi District
- Chitekesa in Phalombe District
- Mkanda in Mchinji District
- Chapananga in Chikwawa District (Ministry of Lands, Housing and Urban Development 2015).

Based on the experience of the RGCP, the Secondary Centres Development Programme (SCDP) was introduced in 1985 to strengthen the growth of smaller urban centres as a means of reducing rural-urban migration to the largest cities, particularly Lilongwe and Blantyre (Manda, 2013). The selection criteria emphasised existing urban centres that needed better planning and infrastructure provision, including those in central locations serving as regional centres (including Mzuzu) and sub-regional centres (including Karonga Town) under the National Physical Development Plan (NPDP) of 1987. By the time the SCDP concluded in 2007, all sub-regional centres had benefited from new layout plans (including the allocation of residential, commercial and industrial plots), sewer disposal ponds, slaughter houses, markets and bus stations, and from the provision of equipment, such as tractors, trailers, computers, and land valuation rolls (Manda 2013). Many of the secondary centres that benefited from the programme were district centres, including:

- Balaka
- Dedza

- Karonga Town
- Kasungu
- Liwonde
- Luchenza
- Mangochi
- Mzuzu City
- Salima

Projects supported under the SCDP in Karonga Town included the construction of drainage channels, sludge ponds, a basic sewage disposal system, the market and bus depot, and the Town Council offices (Figure 6.2). Traditional Housing Areas (THAs[11]) were also upgraded, although many have since deteriorated in the absence of proper urban planning, as discussed in Chapter Nine (section **Error! Reference source not found.**).

Figure 6.1: The original Town Council Offices for Karonga Town

Photo credit: Author (2017)

While the RGCP and the SCDP were seen primarily as rural development strategies, they have been integrated into Malawi's urbanisation strategy supported under the NPDP (Ministry of Lands, Housing and Urban Development 2015). The main objective of the NPDP is to "spread

[11] THAs were originally supported by the colonial administration to provide basic services to informally constructed houses for low-income groups with the main intention of reducing the perceived health impacts of natives on Europeans (UN-Habitat 2010).

the fruits of development as evenly as possible throughout all sections of the population and all parts of the country" (GoM 1987: 1). The NPDP thus addresses spatial development inequities at both the intra-urban scale (within urban centres) and inter-urban scale (between urban centres).

However, the urbanisation process has not resulted in the pattern of urban development envisaged by the NPDP, and has instead resulted in the expansion of unplanned settlements, increasing pressures on overburdened infrastructure and services, and the concentration of national development projects in locations other than those identified by the NPDP (Manda 2013). This situation prompted the national government to prepare the country's first National Urban Policy (NUP) with the aim of ensuring that urbanisation contributes to sustainable development in accordance with the Malawi Growth and Development Strategy (MGDS) III—the country's primary national economic policy.

To inform the NUP, the national government, through the Ministry of Lands and Housing (now the Ministry of Lands, Housing and Urban Development), commissioned an evaluation of the NPDP in relation to the current urban situation (Manda 2013). The evaluation not only indicated that the NPDP has failed to meet its core objectives, demonstrated by the proliferation of unplanned settlements in towns and cities and by the continued concentration of urban centres and the urban population in the Southern Region, but also that available census data are neither accurate nor detailed enough to make accurate judgements concerning the share of the national population living in urban centres of different sizes. Consequently, current urbanisation estimates may not accurately reflect the urban situation on the ground.

6.2 The limitations of current urbanisation estimates

Censuses prior to independence (in 1964) were conducted in 1901, 1911, 1921, 1926, 1931 and 1945, but were neither accurate nor consistent (NSO 2008). The first census in 1901 excluded the African population all together. The quality of censuses improved in 1966 when the first post-independence census involved the training of enumerators and the complete demarcation of enumeration areas to improve coverage. Since 1966, censuses have been undertaken on a roughly decennial basis: 1977, 1987, 1998 and 2008 (the most recent census year) (ibid).

Census data indicate that the share of the national population living in urban areas has increased progressively over time. In 2008, around 15% of the national population (2,003,309) lived in urban areas, up from 6% in 1966 (NSO 2008), making Malawi one of the least urbanised and most rapidly urbanising countries in the sub-continent (Manda 2013), as discussed in Chapter

Five (section 5.1.1). Census data also indicate that most of Malawi's urban population has historically been concentrated in the largest cities (NSO 2010). In 2008, around 78% of the total urban population lived in the four largest cities (including 34% in Lilongwe, 33% in Blantyre, 7% in Mzuzu and 4% in Zomba), while the remaining 22% lived in what the National Statistical Office (NSO) defines as 'other cities' (NSO 2008).

As Manda (2013) argues, however, the accuracy of current urbanisation estimates are questionable given (a) the lack of clear and consistent criteria used by the NSO to define centres as 'urban'; (b) the lack of a clear population threshold to distinguish the smallest towns from rural centres; and (c) the use of administrative criteria rather than population size criteria to define urban centres at different levels of the national urban hierarchy.

Much of the confusion stems from census reports that do not explicitly state the criteria used by the NSO to define urban centres. Reports generally refer to urban centres as including 'primary centres' classified as the four largest cities (Lilongwe, Blantyre, Mzuzu and Zomba) and 'other cities' classified as secondary centres and rural market centres (see NSO, n.d: iii). It is unclear how secondary centres and rural market centres are defined. This confusion is compounded by the six-tier settlement hierarchy (Table 6.1) used by the NPDP to define the functions of urban centres at different tiers and to inform planning activities aimed at achieving a more decentralised pattern of urbanisation, as discussed above.

Table 6.1: Six-tier settlement hierarchy of the NPDP

Level	Category	Number	Names of centres
1	National centres	2	Lilongwe and Blantyre
2	Regional centres	1	Mzuzu
3	Sub-regional centres	7	Karonga Town, Kasungu, Mangochi, Salima, Liwonde, Bangula and Dedza
4	District/main market centres	22	All districts (including Zomba City) and 6 centres (Ntaja, Mponela, Chintheche, Phalombe, Euthini and Monkey Bay)
5	Rural market centres	80	Ngabu, Luchenza, Ekwendeni and Malomo
6	Village centres	Unknown	Dispersed across country

Source: GoM (1987)

Because the hierarchy is based on administrative criteria, it does not accurately reflect the distribution of the urban population based on population size. For example, Zomba is defined as a district/main market centre (the fourth tier) even though it is the formal capital and fourth largest city. The hierarchy was adopted in the 2008 census report to categorise urban centres,

but for unknown reasons, it used the ambiguous categories of ‘primary’, ‘secondary’ and ‘other cities’ (NSO 2010: 26-27).

In response to calls for more detailed census data (see Manda 2013), the NSO (n.d.) released a statistical report with detailed datasets disaggregated for a range of urban centres of different sizes. According to the report, urban centres “were categorized on the basis of orientation towards non-agricultural activity, population concentration and service availability level” (NSO n.d: iii). Based on these criteria, the NSO identified a total of 31 urban centres in Malawi, but neglected to classify them as ‘primary’, ‘secondary’ or ‘other’. A recent report by the World Bank (2016) provided the classifications for each of these urban centres (Table 6.2).

Table 6.2: Urban centres in Malawi defined by the NSO, 2008

Urban centre	Rank	2008 population	Category
Lilongwe	1	669,021	Primary centre
Blantrye	2	661,444	Primary centre
Mzuzu	3	128,432	Primary Centre
Zomba	4	87,366	Primary centre
Mangochi	5	50,821	Secondary centre
Kasungu	6	42,351	Secondary centre
Karonga Town	7	41,074	Secondary centre
Salima	8	27,083	Secondary centre
Nkhotakota	9	24,726	Other centre
Liwonde	10	23,463	Secondary centre
Balaka	11	22,733	Secondary centre
Mzimba	12	20,994	Other centre
Dedza	13	20,241	Secondary centre
Nsanje	14	20,179	Other centre
Thyolo	15	18,589	Other centre
Mchinji	16	17,881	Other centre
Rumphi	17	17,845	Other centre
Mponela	18	15,399	Other centre
Chitipa	19	14,753	Other centre
Ntcheu	20	14,642	Other centre
Mulanje	21	14,487	Other centre
Mwanza	22	14,226	Other centre
Monkeybay	23	11,576	Other centre
Nkhatabay	24	11,576	Other centre
Luchenza	25	11,207	Secondary centre
Ntchisi	26	7,918	Other centre
Ngabu	27	7,523	Other centre
Dowa	28	7,408	Other centre
Chikwawa	29	6,987	Other centre
Chiradzulu	30	2,348	Other centre
Machinga	31	1,180	Other centre

Source: (NSO 2008), compiled and analysed in NSO (n.d.)

The urban centres identified in the Table above suggest that population size was not a major criterion in their definition. For instance, 15 rural market centres with populations greater than 5,000 (Mayaka, Nchalo, Bangula, Dwangwa, Ekwendeni, Jenda, Chintheche, Kamwendo, Chilumba, Madisi, Namitete, Chileka, Ntaja, Thondwe and Mtakataka) were excluded and therefore ostensibly defined as rural (Table 6.3).

Table 6.3: Rural market centres in Malawi

Centre	Population in 2008
Mayaka	17,918
Nchalo	16,798
Mponela	15,399
Bangula	14,451
Monkey Bay	11,576
Dwangwa	11,377
Luchenza	11,207
Ekwendeni	9,398
Jenda	9,070
Chintheche	9,057
Ngabu	7,523
Kamwendo	7,439
Chilumba	7,062
Madisi	6,884
Namitete	6,458
Chileka	5,968
Ntaja	5,937
Thondwe	5,571
Ulongwe	5,501
Mtakataka	5,146
Chipoka	4,314
Euthini	4,107
Borelo	3,788
Chitekesa	3,651
Migowi	2,674
Jali	2,344
Makwasa	2,053

Source: NSO (n.d: 47)

6.3 New urbanisation estimates: Key findings

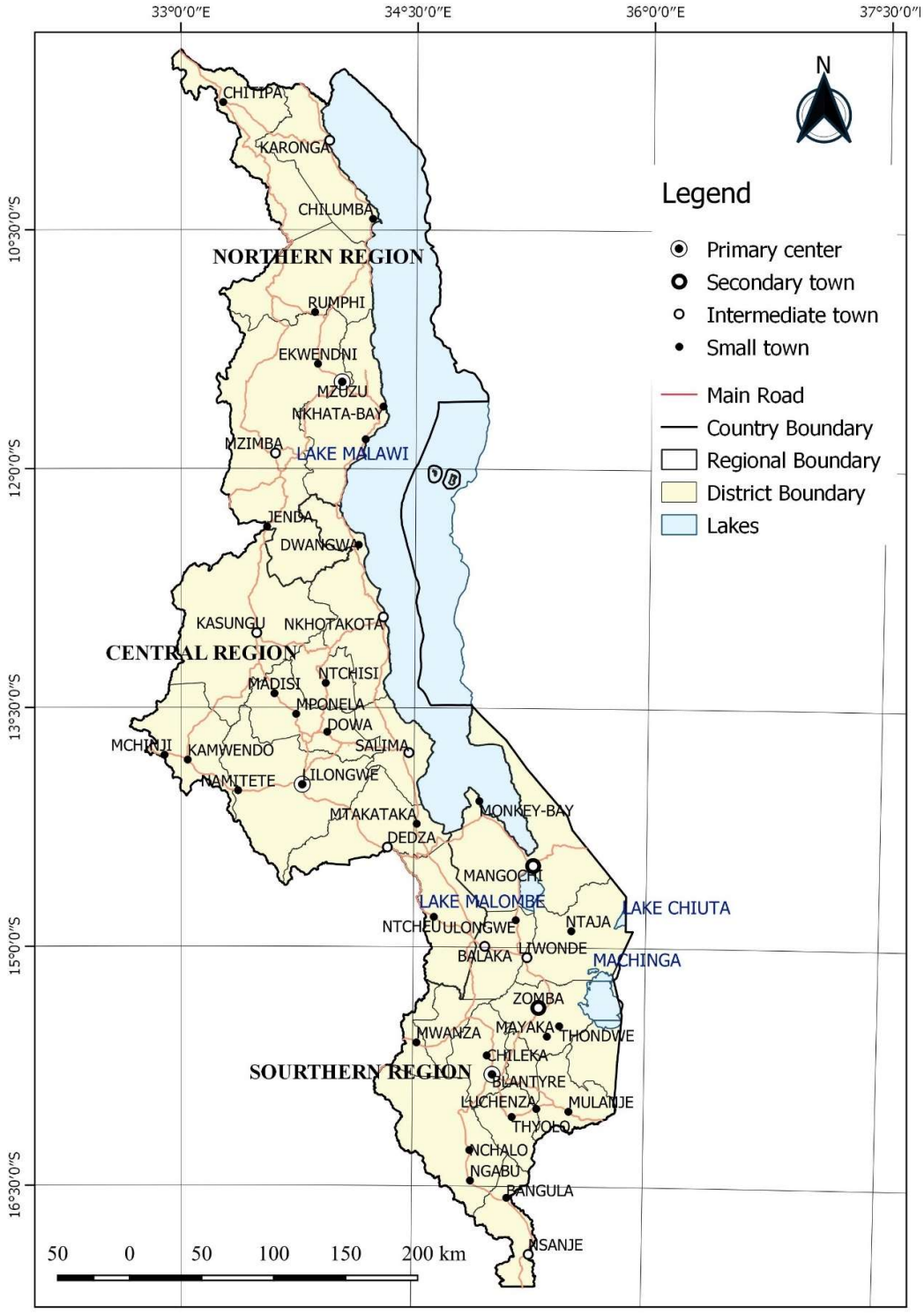
To address the confusion and lack of consensus on how to define urban centres in Malawi, Manda (2013) proposed a new four tier settlement hierarchy based on population size criteria for primary centres (>100,000), secondary towns (50-99,999), intermediate towns (20-49,999) and small towns (5,000-19,999). The hierarchy was proposed with the intention of ensuring that the NUP deliberately promotes decentralised patterns of urban growth and development through targeted investments in infrastructure and services, and that urban centres are properly distinguished from one another based on their size. For instance, rural market centres were renamed small towns “to avoid contradiction in conceptualisation” (ibid: 98).

It has hitherto not possible to use the four tier hierarchy due the lack of census data disaggregated for individual urban centres, as discussed above. In response to calls by Manda (2013) for such data, the NSO released a recent report (NSO n.d.) that presented figures for a broad range of urban centres, including all rural market centres (see Table 6.3 above). Having worked with Manda over the last eight years on a range of urban planning and development issues, he encouraged me to use the four tier hierarchy and the recently released census data to re-assess Malawi's level of urbanisation and its distribution by urban size. Key findings are outlined below. All population figures are drawn from NSO (n.d.) unless otherwise specified.

More people live in urban centres than previously thought

According to the 2008 census, 2,003,309 people in Malawi lived in urban areas, accounting for 15% of the national population (NSO n.d.). However, the new estimates based on the four tier settlement hierarchy indicate that 2,170,399 people lived in urban areas in 2008, accounting for 17% of the national population. In total, 44 urban centres met the population size criteria (>5,000) in the four tier settlement hierarchy to be considered urban in 2008 (Figure 6.2), whereas 31 centres met the NSO criteria to be considered urban in that year (NSO n.d.). The additional 13 urban centres in the four tier hierarchy is explained by the inclusion of the 15 rural market centres with populations greater than 5,000 that the NSO defined as rural, as identified above, and the exclusion of the two rural market centres (Chiradzulu and Machinga) with populations less than 5,000 that the NSO defined as urban. The estimates of urbanisation levels presented here are considered to more accurate than those of the NSO because they are based on explicit population size criteria.

Figure 6.2: Map of Malawi's urban settlement hierarchy, 2008



Source: Author (2018)

More people live in smaller urban centres than previously thought

Previous estimates by the NSO indicate that 78% of the national population lives in the four largest cities (Lilongwe, Blantyre, Zomba and Mzuzu) in 2008. In contrast, the new estimates presented here indicate that 71% of the national population lived in the four largest cities in that year. The decrease in the share of the national urban population living in the four largest cities is due to the criteria used by the four tier hierarchy, which includes the 15 rural market centres that the NSO defined as rural, thus increasing the denominator. Based on the hierarchy, the share drops to 67% if Zomba with a population of 88,314 is defined as a secondary town rather than as a primary centre. If so, 6% of the urban population lived in two secondary towns (Zomba alongside Mangochi), while 11% lived in nine intermediate towns (including Karonga Town) and 15% lived in 30 small towns, accounting for the remaining 33% of the urban population (Table 6.4).

Table 6.4: The distribution of the national urban population based on the four tier settlement hierarchy, 2008

	Number of centres	Population	Share of total urban population (%)
Primary centres (>100,000)	3	1,458,897	67.2
Secondary towns (50-99,999)	2	139,135	6.4
Intermediate towns (20-49,999)	9	243,613	11.2
Small towns (5,000-19,999)	30	328,754	15.1
Total	44	2,170,399	100.0

Source: 2008 census data (NSO n.d.), analysed and presented by author

Smaller urban centres are among the fastest growing

Unfortunately, census data on urban growth rates for 15 small towns (including many rural market centres) prior to 2008 were not available in the NSO (n.d.) report (Table 6.5). Growth rates between 1987 and 2008 were therefore calculated for urban centres with known population sizes, meaning that the growth of small towns as a whole is under-represented. The estimates nevertheless indicate that primary centres grew at 8% followed by small towns and intermediate towns at 7%, respectively, and secondary towns at 6% during this period.

When disaggregating urban growth rates for individual urban centres, the estimates indicate that small towns were both among the fastest and slowest growing overall (Table 6.5). In particular, both Thyolo and Mchinji had the fastest intercensal growth rates of 17%. While Mzuzu and Lilongwe had relatively fast growth rates at 10% and 9%, respectively, they were

outpaced by Kasungu and Mwanza at 13% and 10%, respectively. Both Zomba and Blantyre grew at slower rates at 5%.

Table 6.5: Fastest growing urban centres in Malawi by urban size, 1987-2008

Rank	Centre	1987	2008	Annual growth % rate	Urban size	Region
1	Thyolo	4,251	18,589	16.9	Small town	Southern
2	Mchinji	4,525	17,881	16.9	Small town	Central
3	Kasungu	10,848	42,351	13.3	Intermediate town	Northern
4	Mangochi	15,329	50,821	11.6	Secondary town	Southern
5	Mwanza	4,710	14,226	10.1	Small town	Southern
6	Mzuzu	44,238	128,432	10.1	Primary centre	Northern
7	Lilongwe	233,978	669,021	9.4	Primary centre	Central
8	Chitipa	5,233	14,753	9.1	Small town	Northern
9	Dowa	2,704	7,408	8.7	Small town	Central
10	Mponela	5,609	15,399	8.7	Small town	Central
11	Mzimba	7,735	20,994	8.6	Intermediate town	Northern
12	Liwonde	8,685	23,463	8.5	Intermediate town	Southern
13	Salima	10,606	27,852	8.1	Intermediate town	Central
14	Rumphi	7,147	17,845	8.2	Small town	Northern
15	Ntchisi	3,060	7,918	7.9	Small town	Central
16	Ntcheu	5,806	14,642	7.6	Small town	Central
17	Balaka	9,081	22,733	7.5	Intermediate town	Southern
18	Karonga Town	19,630	41,074	5.3	Intermediate town	Northern
19	Zomba	42,878	88,314	5.3	Secondary town	Southern
20	Nkohotakota	12,149	24,726	5.2	Intermediate town	Central
21	Mulanje	7,112	14,487	5.2	Small town	Southern
22	Nsanje	10,042	20,179	5.0	Intermediate town	Southern
23	Blantyre	331,588	661,444	5.0	Primary centre	Southern
24	Luchenza	6,145	11,207	4.1	Small town	Southern
25	Nkhata Bay	6,492	11,265	3.7	Small town	Northern
26	Monkey Bay	6,868	11,576	3.4	Small town	Southern
27	Dedza	16,735	20,241	1.1	Intermediate town	Central
28	Mayaka	--	17,918	--	Small town	Southern
29	Nchalo	--	16,798	--	Small town	Southern
30	Bangula	--	14,451	--	Small town	Southern
31	Dwangwa	--	11,377	--	Small town	Central
32	Ekwendeni	--	9,398	--	Small town	Northern
33	Jenda	--	9,070	--	Small town	Northern
34	Chintheche	--	9,057	--	Small town	Northern
35	Ngabu	--	7,523	--	Small town	Southern
36	Kamwendo	--	7,439	--	Small town	Central

37	Chilumba	--	7,062	--	Small town	Northern
38	Madisi	--	6,884	--	Small town	Central
39	Namitete	--	6,458	--	Small town	Central
40	Chileka	--	5,968	--	Small town	Southern
41	Ntaja	--	5,937	--	Small town	Southern
42	Thondwe	--	5,571	--	Small town	Southern
43	Ulongwe	--	5,501	--	Small town	Southern
44	Mtakataka	--	5,146	--	Small town	Central

Data source: NSO (2008), analysed and presented in NSO (n.d.)

That smaller urban centres account for a larger share of the national urban population than previously thought, as shown above, and that they are among the fastest growing, indicates that the policy objective under the NPDP of decentralising urban growth away from the four largest cities may have had more success than previous evaluations suggest (see Manda 2013).

Smaller urban centres' contribution to overall urban population growth is relatively small

Table 6.6 combines the population increment for the 27 urban centres with known population sizes in 1987 and 2008 in the four tier settlement hierarchy, excluding the 17 small towns with missing population figures for 1987 listed in Table 6.4 above. Table 6.6 indicates that primary centres accounted for the majority of total urban population growth at 859,868 between 1987 and 2008 followed by intermediate towns at 104,529, small towns at 93,466 and secondary towns at 80,928.

Table 6.6: Combined population increment and average growth rates by urban size category, 1987-2008

	Urban population growth increment	Share of total urban population growth (%)
Primary centres (>100,000)	859,868	75.5
Secondary towns (50-99,999)	80,928	7.1
Intermediate towns (20-49,999)	104,529	9.2
Small towns (5,000-19,999)	93,466	8.2
Total	1,138,791	100

Data source: NSO (n.d.), analysed and presented by author

While many smaller urban centres are among the fastest growing, Table 6.6 shows that their contribution to total urban population growth between 1987 and 2008 was limited relative to primary centres, which accounted for 76% of total urban population growth between 1987 and 2008. Secondary, intermediate and small towns accounted for the remaining 24%, amounting to 278,923. But despite the rapid growth of some smaller urban centres (such as Thyolo, Mchinji,

Mwanza and others), their populations remain too small to rival the contribution of the largest cities to total urban population growth.

Intermediate towns are increasing in number and population size

While there were only nine intermediate towns (including Karonga Town) in 2008, they accounted for 11% of the national urban population and 9% of total urban population growth between 1987 and 2008. Given their rapid annual growth rates, 8 other intermediate towns are likely to emerge by 2018 (Table 6.7). By then, Karonga Town and Kasungu are expected to join Mangochi as secondary towns (it is likely that Zomba will become a primary centre by 2018). These trends not only demonstrate the growing importance of intermediate towns in the national urban hierarchy, but also Karonga Town's emerging status as a larger urban centre.

Table 6.7: Emerging intermediate towns* in Malawi

Centre	Population (2008)	Average annual % growth rate
Thyolo	18,589	16.9
Rumphi	18,845	8.2
Mchinji	17,881	16.9
Mponela	15,399	8.7
Chitpa	14,753	9.1
Ntcheu	14,642	7.6
Mulanje	14,487	5.2
Mwanza	14,226	10.1

* Defined as those with between 5,000-19,999 inhabitants
Data source: NSO (n.d.), analysed and presented by author

Urban centres and the urban population remain concentrated in the Southern Region

It is difficult to compare the distribution of the urban population between regions given the lack of census data for all urban centres in different census years and the lack of a clear criteria used by the NSO to define urban centres, as discussed above. It was therefore not possible to compare changes in the distribution of the urban population between regions. Previous estimates nevertheless indicate that the Northern Region has historically accounted for a much smaller share of the urban population due in part to its geographic isolation and lack of infrastructure investment (Manda 2013).

Available 2008 census data for all 44 urban centres in the four tier settlement hierarchy correspond with these estimates, indicating that the Southern Region had the largest number of urban centres (19) followed by the Central Region (14) and the Northern Region (11), and that the share of the total urban population was highest in the Southern Region (47%) followed by

the Central Region (39%) and the Northern Region (14%). The findings demonstrate the persistence of regional urban population imbalances, despite the objectives of the NPDP.

6.4 Limitations

The analysis of census data demonstrated two main limitations. First, the most recent census data are from 2008 and are therefore outdated (the 2018 census was not publicly available during the analysis). Consequently, the 44 urban centres that were identified may not accurately represent current urbanisation patterns.

Second, census reports do not typically provide figures for individual urban centres, except for the four largest cities. Nor do they specify any clear criteria used by the NSO to define urban centres. It is therefore unclear whether the census data (NSO n.d.) analysed here were inclusive of all urban centres, despite efforts to include all rural market centres with populations greater than 5,000. The use of explicit population size criteria to measure urbanisation trends and urban size distributions nevertheless means that the estimates presented in this Chapter are considered to be the most accurate to date.

6.5 Discussion

Urbanisation is itself a determinant of health in that it concentrates an increasing number of people in both absolute and relative terms in urban living environments, as discussed in Chapter Two (section **Error! Reference source not found.**.1). In this sense, the finding that one-third of Malawi's urban population lives in centres with populations smaller than the four largest cities, versus previous estimates that peg the figure at 22%, indicates that smaller settlements are more important to national urban health than previously thought.

The finding that smaller urban centres were among both the fastest and slowest growing urban centres overall means that their environmental health situations are likely influenced by more than just the speed of their growth and their capacity to plan for it. In smaller urban centres that are not growing, including those with populations that may be declining, the challenges facing urban planning may have more to do with managing existing environmental hazards and providing and/or improving services to existing populations.

Given that smaller centres, particularly intermediate towns, which include Karonga Town, are expected to accommodate a growing share of future urban growth, national urban health will depend increasingly on what is done to plan and manage the process outside the four largest cities, which continue to dominate scholarly and practical attention. However, in absolute terms,

the four largest cities are expected to account for the majority of future urban growth given the size of their populations, meaning that they will remain key priority areas for urban planning, despite the growth of many small and intermediate towns.

The adoption of the four tier settlement hierarchy by the NSO and the Physical Planning Departments represents an important opportunity to generate the type of detailed demographic data that is required to develop a more accurate understanding of urbanisation patterns and urban size distributions, and to use this data for policy as well as statistical purposes. Practical insights for the NSO and the Physical Planning are provided in Chapter Eleven (section 11.4) with the aim of improving the reporting and use of the census to that end.

6.6 Conclusion

Manda's (2013) evaluation of urbanisation trends in Malawi identified major limitations in the statistical criteria used by the NSO to both define urban centres and classify them by urban size. To address these limitations, Manda (2013) guided me in the operationalisation of his four tier settlement hierarchy to analyse the census data released by the NSO (n.d.) for individual urban centres. This analysis marked the first known time that Malawi's urban population has been systematically disaggregated by urban size beyond the four largest cities, raising new insights into urbanisation patterns and trends that can be further explored when the 2018 census is released.

Building on the findings above, the following Chapter uses the 44 urban centres identified in the four tier settlement hierarchy as a sample framework to compare differentials in environmental health by urban size, providing new insight into the nature of these differentials at the inter-urban scale.

Chapter 7 Comparing inter-urban differentials in environmental health in Malawi

It has long been suspected that some of the worst environmental hazards in urban areas may be experienced by populations in smaller urban centres (Dodman et al. 2009; Hardoy et al. 2001; Satterthwaite 2016a; Satterthwaite and Tacoli, 2003; UN-Habitat 2006). Satterthwaite and Tacoli (2003) posit that:

> "… if there were a stronger information base about who has access to those forms of infrastructure and services that are critical determinants of health (provision for water, sanitation, health care, emergency services) and a stronger information base related to health outcomes (for instance, infant and child mortality rates, life expectancies, nutritional status), we would find that the urban populations in small and intermediate urban centres would generally be worse off than the urban average" (ibid: 39).

The Demographic and Health Survey (DHS) data reviewed in Chapter One (section 1.1.3) support this hypothesis in relation to provision of piped water in the home, flush toilets and electricity, which were shown to be lower in smaller than larger urban centres (Hewett and Montgomery 2001). To test this hypothesis in Malawi, this Chapter analyses the 2010 DHS to compare inter-urban differences in environmental health and its determinants using a stratified sample of urban centres of different sizes and locations, addressing the second research objective:

- To test the hypothesis that environmental health may be especially poor in smaller urban centres through an analysis of the 2010 Malawi DHS.

While the most recent 2015 Malawi DHS was made publicly available after the analysis began, the 2010 DHS was chosen to correspond with the urban population estimates from the most recent 2008 census. The 2018 census was not publicly available during the study.

This Chapter is comprised of eight sections. Section one explains the sample used by the 2010 DHS and identifies its limitations for inter-urban analysis. Section two outlines an alternative sample framework based on the 44 urban centres that were identified in the four tier settlement hierarchy based on the analysis of census data in Chapter Six. Section three outlines the sampling procedure that was used to disaggregate the DHS based on this hierarchy. Section four identifies the indicators that were used to measure environmental health and its determinants. Section five presents the indicator estimates, and section six discusses the key findings. Section seven

outlines the limitations of the analysis, while section eight concludes. The main findings are synthesised in Chapter Eleven (section **Error! Reference source not found.**).

7.1 Limitations of the DHS sample

Malawi is composed of 28 administrative districts, which the National Statistical Office (NSO) subdivides into enumeration areas (EAs) to facilitate censuses and other household survey programmes (NSO and ICF Macro 2010). The 2010 DHS used 849 EAs (also termed 'clusters') as sample units, including 158 urban EAs and 691 rural EAs in all districts. The sampling procedure entailed three stages.

In the first stage, the NSO stratified the sample to ensure there were sufficient clusters to represent households in each district (at least 950 households). Therefore, clusters were not allocated in proportion to each district's contribution to the national population so that the largest districts were not overrepresented. For example, districts in the Northern Region were oversampled to account for its smaller population. So too were urban areas, since as much as 84% of the national population lives in rural areas, according to the 2008 census (NSO 2008).

In the second stage, households in each district were sampled using household lists from each cluster to achieve a statistically representative sample of the national population. 27,345 households were sampled, of which 27,307 were selected and 25,311 were occupied. In total, 24,825 households were successfully interviewed, including 2,909 urban households, achieving a response rate of 98% (Table 7.1).

Table 7.1: 2010 DHS sample size and response rates

	Place of residence		
	Urban	**Rural**	**Total**
Households interviewed			
Households selected	3,157	24,150	27,307
Households selected (occupied)	2,965	21,916	25,311
Households interviewed	2,909	21,916	24,825
Household response rate	98.1%	98.1%	98.1%

Source: NSO and ICF Macro (2010)

In the third stage, clusters were randomly displaced by up to 2 kilometres in urban areas and up to four kilometres in rural areas, with every 100th cluster displaced by up to 10 kilometres to protect the confidentiality of respondents. Displacement can occur in any random direction angle between 0 and 360 degrees, although each new location must fall within its original boundary at the District level. Displacement was introduced when the DHS made available

Geographic Positioning System (GPS) data for clusters in the early 2000s (Perez-Heydrich et al. 2013). In Malawi, GPS data for individual survey clusters have been available since 2000, enabling spatial analysis.

Despite the introduction of spatial data, the definition of urban areas used by the DHS is unclear, making it difficult to conduct inter-urban analysis. It is likely that the NSO, which administers both the census and the DHS, uses its own ambiguous definition of urban areas, which is often—though not always—limited to the four largest cities and 'other' cities, as discussed in Chapter Six (section 6.2). Repeated efforts to contact the NSO to clarify its definition yielded no concrete answers. Even if a clear definition of urban areas was specified, the DHS does not include a variable for urban size, except for three arbitrary categories: 'capital', 'major city' and 'town'. Consequently, it was not possible to disaggregate urban centres by their size based on the DHS recode file[12].

7.2 Developing a new sample by urban size

Given the limitations above, a new sample framework was developed based on the four tier settlement hierarchy that was used to analyse the census data in the previous Chapter. A total of 44 urban centres with populations greater than 5,000 were identified in the hierarchy, including three primary centres, two secondary towns, nine intermediate towns and 30 small towns. The DHS clusters located in each urban centre and their total sample sizes and share of their total populations are specified in the right-hand column of Table 7.2. All figures in this section are for 2008 unless otherwise specified.

[12] The recode file is in a standardised format to enable comparisons across surveys and can be downloaded from the USAID website upon receiving ethics approval. Recode files are available in SPSS, STATA and other statistical software packages. Recode files are used to generate country-level reports and facilitate other analysis. Ethics approval was obtained from USAID prior to data analysis.

Table 7.2: Sample using the four tier settlement hierarchy

Category/ tier	Population size	No.	Urban centres	Region	DHS Clusters	No. of household members/ share urban
Primary centres	> 100,000	3	Lilongwe (669,021)	Central	163, 209, 220, 261, 264, 282, 361, 375, 390, 417, 435, 477, 556, 591, 609, 636, 671, 711, 727, 772, 798, 804, 816	2,016/ 0.3%
			Blantyre (661,444)	Southern	24, 85, 92, 106, 110, 126, 129, 140, 151, 175, 183, 185, 239, 240, 269, 289, 290, 293, 302, 310, 334, 374, 398, 412, 422, 428, 430, 437, 508, 535, 558, 559, 573, 622, 624, 666, 673, 687, 768, 771, 800, 803, 833	3,664/ 0.6%
			Mzuzu (128,432)	Northern	0	0
Secondary Towns	50-99,999	2	Zomba (88,314)	Southern	100, 516	178/ 0.2%
			Mangochi (50,821)	Central	323, 555, 690, 746, 794	579/ 1.1%
Intermediate Towns	20-49,999	9	Kasungu (42,351)	Central	103, 113	171/ 0.4%
			Karonga Town (41,074)	Northern	188, 384, 461, 522, 592, 595	539/ 1.3%
			Salima (27,852)	Central	389, 510, 643, 718, 816	451/ 1.6%
			Nkhotakota (24,726)	Central	57, 483, 628	262/ 1.1%
			Liwonde (23,463)	Southern	31, 102, 241	288/ 1.2%
			Balaka (22,733)	Southern	427, 440, 633, 824	389/ 1.7%

			Mzimba (20,994)	Northern	13, 178, 203, 221, 229, 577, 642, 698	748/ 3.6%
			Nsanje (20,779)	Southern	158, 675, 686, 797, 817	495/ 2.4%
			Dedza (20,241)	Central	121, 325, 451	324/ 1.6%
Small towns	5,000-19,999	30	Thyolo (18,589)	Southern	0	0
			Mayaka (17,918)	Southern (unknown location)	0	0
			Mchinji (17,881)	Central	561, 634	175/ 1%
			Rumphi (17,845)	Northern	16, 320, 342, 728, 784	545/ 3.1%
			Nchalo 16,798	Southern	148, 312, 776	406/ 2.4%
			Mponela (15,399)	Central	35, 274, 350	347/ 2.3%
			Chitipa (14,753)	Northern	63, 76, 134, 196, 330, 747	659/ 4.5%
			Ntcheu (14,642)	Central	176, 358, 502	244/ 1.7%
			Bangula (14,451)	Southern	172, 545	336/ 2.3%
			Mulanje (14,487)	Central	526	83/ 0.6%
			Mwanza (14,226)	Southern	238, 313, 373, 432, 645	540/ 3.8%
			Monkey Bay (11,576)	Southern	572	170/ 1.5%
			Dwangwa (11,377)	Central	192	180/ 1.6%
			Nkhata Bay (11,265)	Northern	65, 494, 745	299/ 2.7%
			Luchenza (11,207)	Southern	198, 599, 623, 743, 837	514/4.6%
			Ekwendeni (9,398)	Northern	394	144/ 1.5%
			Jenda (9,070)	Northern	180	172/ 1.9%
			Chintheche (9,057)	Northern	75, 173, 546	599/ 6.6%
			Ntchisi (7,918)	Central	0	0
			Ngabu (7,523)	Southern	0	0
			Kamwendo (7,439)	Central	90, 836	314/ 4.2%
			Dowa (7,408)	Central	0	0
			Chilumba (7,062)	Northern	207, 210, 449, 557	550/ 7.8%

Madisi (6,884)	Central	74, 563, 567, 828	546/ 7.9%
Namitete (6,458)	Central	0	0
Chileka (5,968)	Southern	0	0
Ntaja (5,937)	Southern	0	0
Thondwe (5,571)	Southern	450	129/ 2.3%
Ulongwe (5,501)	Southern	138, 752	264/ 4.8%
Mtakataka (5,146)	Central	327	167/ 3.2%

Source: Hierarchy proposed by the Ministry of Lands and Housing (2013b), and populated with 2008 census data (NSO, n.d.) by author

Table 7.3 enumerates the total sample size and share of the urban population in each of the hierarchy's four tiers. Three observations stand out. First, whereas the DHS included 158 urban clusters, the four tier settlement hierarchy included an additional 8 urban clusters, totalling 166. Second, whereas the DHS sampled 2,909 urban households, the four tier hierarchy sampled an additional 1,110 urban households, pushing the total to 4,019.

Table 7.3: Total sample size and share of the urban population at each tier of the hierarchy

	Number of clusters	Total households	Share of urban population by size category	Share of total urban sample
Primary centres (>100,000)	62	1,284	0.4%	32.7%
Secondary towns (50-99,999)	7	154	0.5%	4.3%
Intermediate towns (20-49,999)	38	1,130	1.5%	21.5%
Small towns (5,000-19,999)	59	1,541	2.1%	41.5%
Total	166	4,109	--	100%

Analysed and presented by author

Third, the increase in the sample size for urban households in the four tier hierarchy was due to the inclusion of an unknown number of urban centres that the DHS recode file categorised as rural, amounting to 1,546 rural households that were recategorised as urban (Table 7.4). It is likely that the additional eight urban clusters included in the sample were located in small towns that the NSO defined as rural. This is plausible given that many clusters for small towns have sample sizes greater than 100 households and thus could account for the additional 1,110 households that were included here.

Table 7.4: The DHS classification of urban and rural households included in the four tier hierarchy

	Number of households	Share of households in total sample
Urban households sampled	2,563	62.4
Rural households re-categorised as urban	1,546	37.6
Total	4,109	100

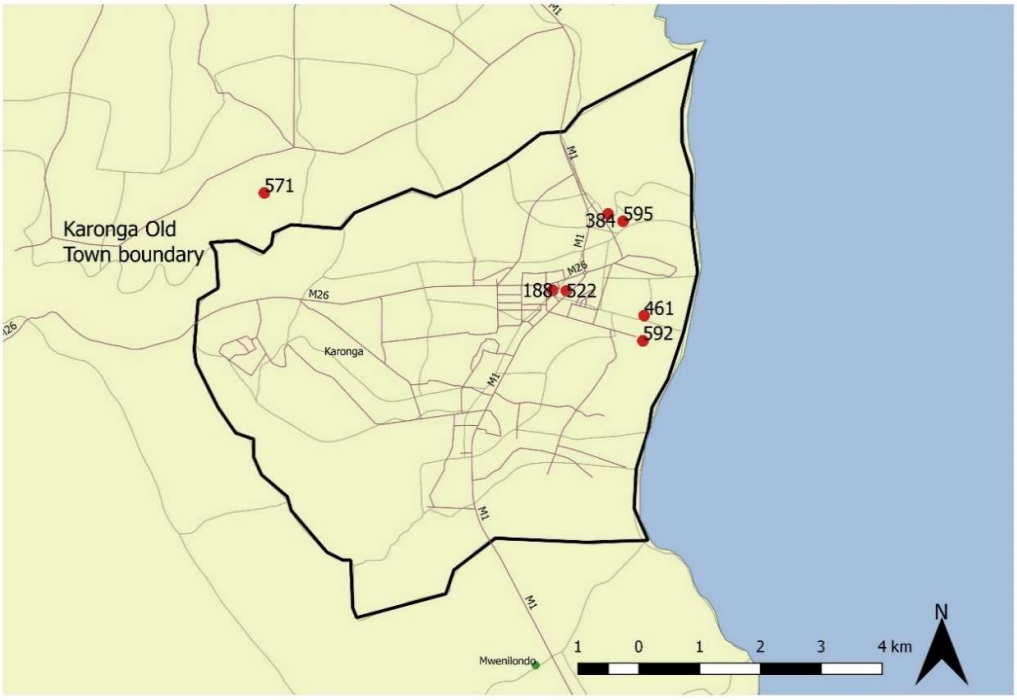
Analysed and presented by author

7.3 Sampling procedure

The sampling procedure entailed four stages. First, the variable in the DHS recode file (HV001) that specifies the coordinates of each cluster in Malawi were mapped using QGIS. Second, available geographic information—including the boundaries of all districts; the administrative boundaries of urban areas with spatial data (limited to the four largest cities and Karonga Town); the coordinates of many, though not all, settlements (undefined); some buildings (mainly in larger urban centres); and larger medical centres and hospitals—were mapped to delineate the general boundaries and spatial extents of the 44 urban centres identified in the four tier hierarchy. Since many urban centres in Malawi do not have clear boundaries, satellite imagery was consulted to approximate their location in relation to physical signifiers in the landscape, including urban footprints, landmarks (hospitals) and road networks.

Third, buffers with four-kilometre radii were drawn around each of the 44 urban centres to determine whether clusters with two- and four-kilometre offsets could plausibly be located within the spatial extents of each centre. The exception was the three largest cities, which function as their own districts, meaning that the displacement of their clusters should not occur outside their administrative boundaries. In all other urban centres, the four-kilometre buffer was used since it was not known which centres the DHS defined as urban or rural and therefore which buffer was applied. This procedure was intended to limit the potential for misclassification of clusters as much as possible. For example, the six clusters (188, 152, 384, 461, 592 and 595) located in Karonga Town were identified using the map illustrated in Figure 7.1 in combination with satellite imagery. Cluster 571 was excluded, since it could have been displaced from outlying rural areas into the town.

Figure 7.1: Displaced clusters in Karonga Town sampled by the 2010 Malawi DHS



Data source: Spatial information from the Department of Surveys, GPS data for clusters from NSO and ICF Macro (2017), map by author

Clusters with 10-kilometre offsets (every 100th cluster) could have been unintentionally sampled. In total, 35 out of the 44 urban centres in the hierarchy contained plausible clusters, excluding Mzuzu, Mayaka, Ntchisi, Ngabu, Dowa, Namitete, Chileka, Ntaja, Ulongwe and Mtakataka. The limitations associated with the exclusion of Mzuzu, as the fourth largest city, are discussed below.

Fourth, because the DHS lacked a clearly defined variable for urban size, individual recode files were created for each of the hierarchy's four tiers to facilitate inter-urban analysis. Each file was created by deleting clusters that were not located in urban centres at each tier. The same process was replicated for all individual urban centres. Lastly, once the hierarchy was populated, the DHS recode file was cleaned of all missing values.

7.4 Indicators

The indicators for environmental health outcomes and their determinants are outlined in Table 7.5. They were chosen based on the detailed evidence review by the World Health Organization (WHO) (Prüss-Üstün and Corvalan 2006) as well as consultations with the Karonga District Health

Management Team (DHMT), as discussed in Chapter Four (section **Error! Reference source not found.**).

Table 7.5: Indicators for environmental health determinants and outcomes

Environmental health determinants	Environmental health outcomes among children >5years
• Access to piped water in the home • Access to flush toilets • Access to electricity	• Incidence of diarrhoea • Under-five mortality rates

The indicators for environmental health determinants were limited to those available in the DHS household questionnaire. Levels of access to basic services (water, sanitation and electricity) were selected since they have been found to vary between urban centres of different sizes, as reviewed in Chapter One (section 1.1.3). The indicators for environmental health outcomes were selected from the DHS questionnaire for children (or 'kids file'). Diarrhoea was selected as an indicator because it is strongly linked to poor water and sanitation and is a main cause of morbidity and mortality among children under five years, particularly in poor quality living environments (Prüss-Üstün and Corvalan 2006; Hardoy et al. 2001). Under-five mortality rates were also selected because they are strongly linked to infectious and parasitic diseases and tend to thrive in poor quality living environments as well (Hardoy et al. 2001).

7.5 Environmental health at the inter-urban scale: Key findings

The indicators above were analysed at three successive scales:

- Between urban centres of different sizes at the national scale;
- Between urban centres at the regional scale (North, Central and South); and
- Between individual urban centres of different sizes.

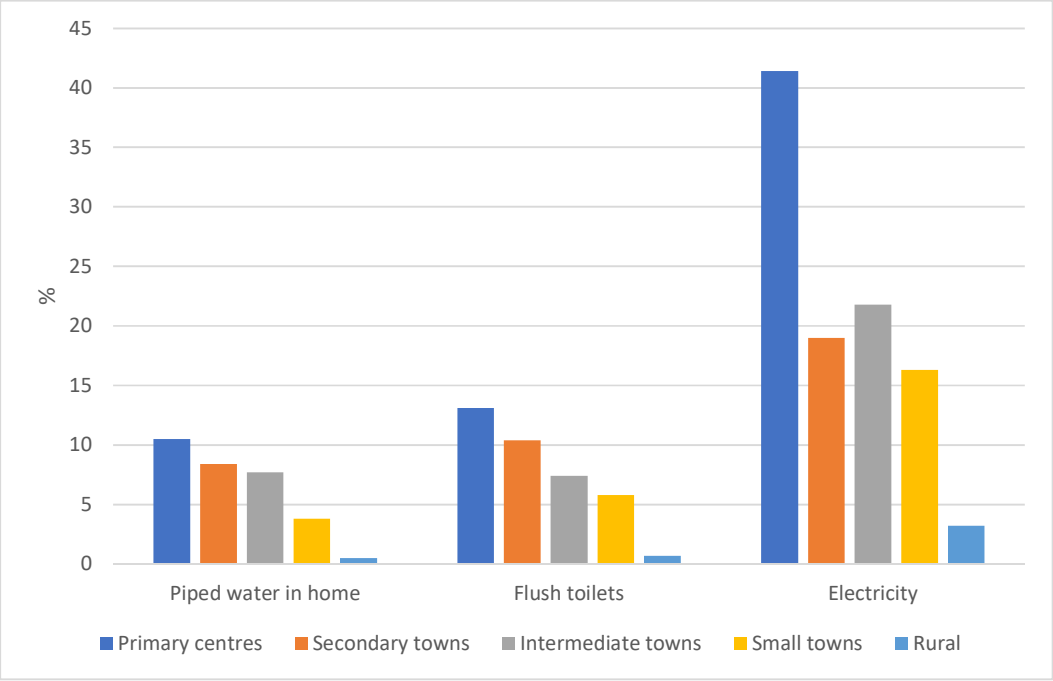
The indicators for environmental health outcomes were limited to the first scale of analysis, since the primary interest was understanding differentials between urban centres of different sizes. Estimates for rural areas are provided to contextualise the urban estimates. The key findings are presented below.

7.5.1 Comparing environmental health between urban centres of different sizes

Access to water, sanitation and electricity

Figure 7.2 shows that small towns had the lowest access to piped water in the home, flush toilets and electricity at 4%, 6% and 16%, respectively, followed by intermediate towns at 8%, 7% and 22% respectively. By comparison, overall access was highest in primary centres at 11%, 13% and 41%, followed by secondary towns at 8%, 10% and 19%, respectively, except for electricity, which was higher in intermediate towns. In all size categories, levels of access were considerably higher than in rural areas. These findings indicate that access to water, sanitation and electricity tend to decline the small the urban size**.**

Figure 7.2: Share of households with access to piped water in the home, flush toilets and electricity by urban size, 2010

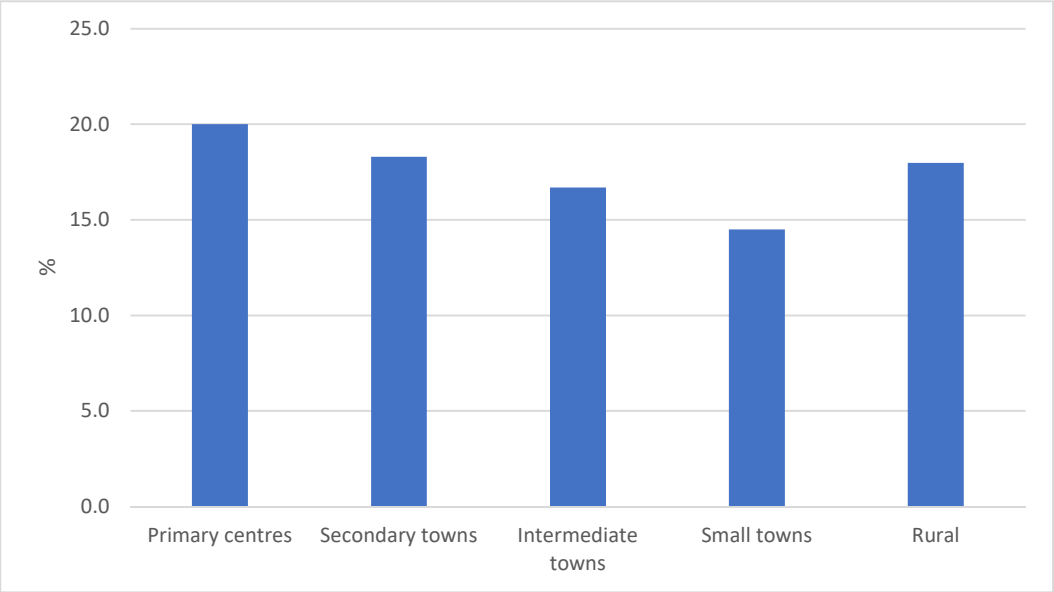


Source: Data from NSO and ICF Macro (2010), presented by author

Incidence of diarrhoea among children under five years

Figure 7.3 shows that diarrhoea among children under five years in the two weeks preceding the survey was highest in primary centres at 20% followed by secondary towns at 18%, intermediate towns at 17% and small towns at 15% compared to 17% in rural areas.

Figure 7.3: Share of children (<5 years) with diarrhoea in the two weeks preceding the survey by urban size, 2010



Source: Data from NSO and ICF Macro (2010), analysed and presented by author

Table 7.6 presents the under-five mortality rates for urban centres at each level of the four tier hierarchy. It indicates that small towns performed the best with 70 deaths per 1,000 live births followed by intermediate towns at 82 deaths per 1,000 live births, primary centres with 84 deaths per 1,000 live births, and secondary towns 148 deaths per live births. By comparison, the under-five mortality rate in rural areas was 130 deaths per live births (see Table 8.3 in NSO and ICF Macro, 2010: 98).

Table 7.6: Under-five mortality rates at the inter-urban scale

	Total number of children in each tier	Children under 5 in each tier	# of children under 5 who died	Under-five mortality rate
Primary centres	2,965	817	77	94.2
Secondary towns	355	122	18	147.5
Intermediate towns	2,094	551	45	81.7
Small towns	2,492	1,235	86	69.6
Rural areas	N/A	N/A	N/A	130*

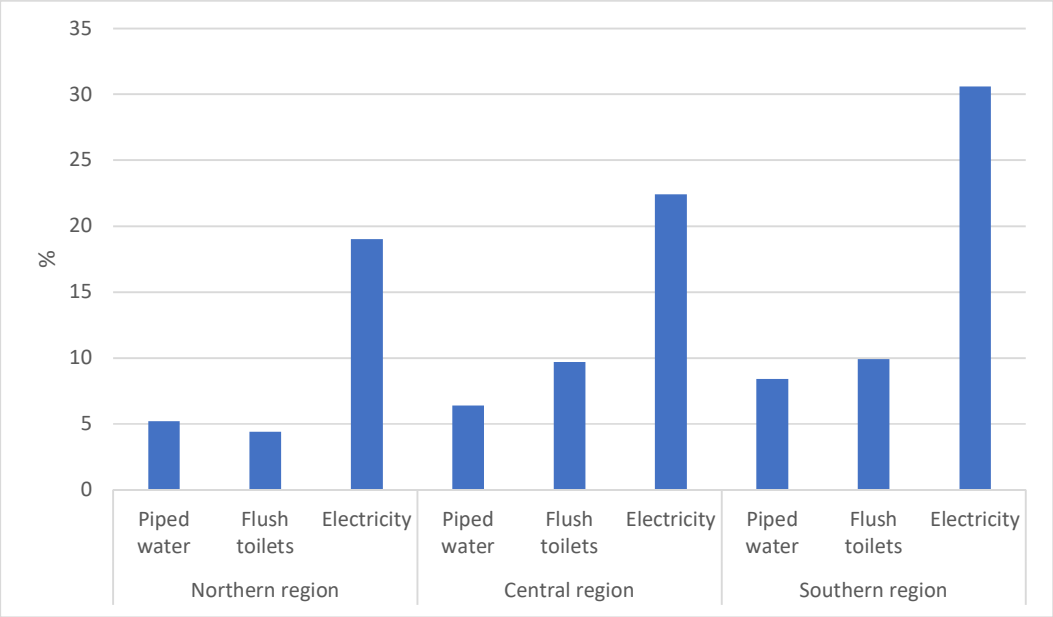
Source: Data from NSO and ICF Macro (2010), analysed and presented by author
Source: Table 8.3 in NSO and ICF Macro (2010: 98)

7.5.2 Comparing environmental health between urban centres of different sizes at the regional scale

Access to water, sanitation and electricity

Figure 7.4 shows that access to piped water in the home, flush toilets and electricity were lowest in the Northern Region at 5%, 4% and 19%, respectively, followed by the Central Region at 6%, 10% and 22% respectively. The Southern Region had the highest levels of access to piped water and electricity at 8% and 31%, respectively, except for access to flush toilets, which at 10% was the same in the Central Region. Overall, electricity accounted for the largest regional differentials, particularly between the North and South. These observations correspond with previous assessments that found similar regional imbalances between levels of service provision in Malawian urban centres (see Manda, 2013).

Figure 7.4: Share of urban households with access to piped water in the home, flush toilets and electricity by region, 2010

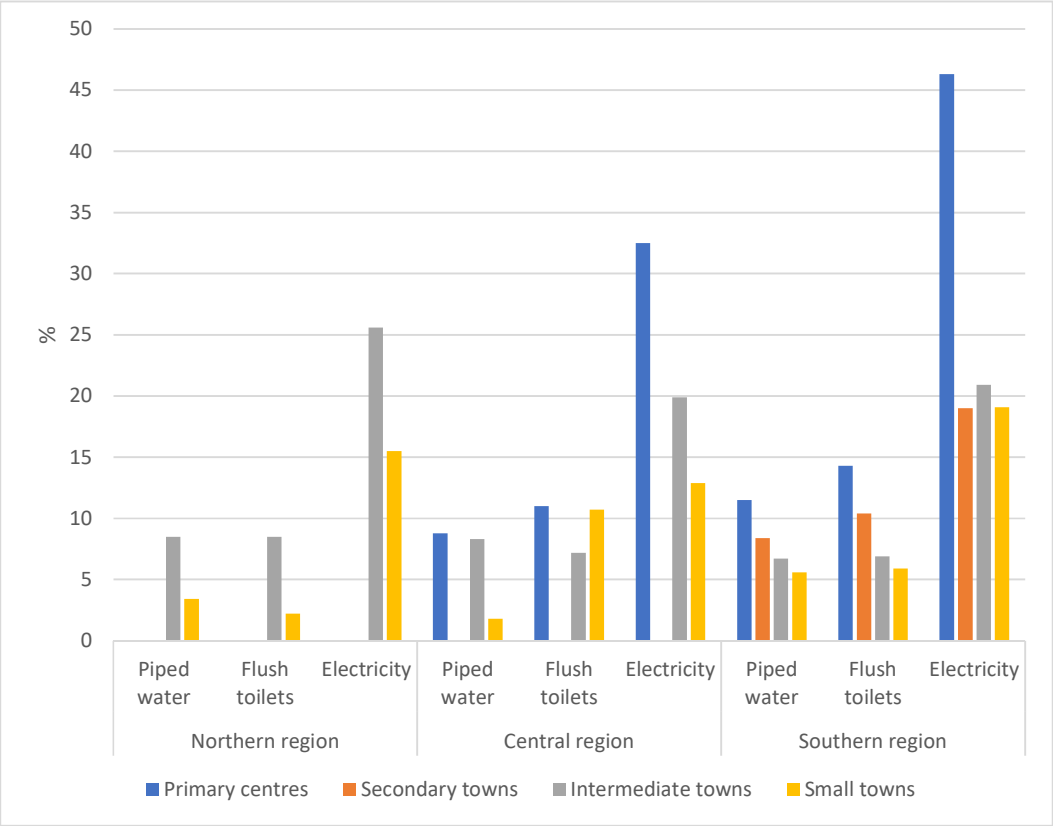


Source: Data from NSO and ICF Macro (2010), analysed and presented by author

Figure 7.5 shows that access to piped water in the home, flush toilets and electricity tends to decline the smaller the urban size in each region, with the small towns in the North being the most under-served. Conversely, primary centres had the highest access to piped water, flush toilets and electricity in each region, except in the Northern Region, where there are no primary centres. Secondary towns had the second highest access to piped water, flush toilets and electricity at 8%, 10% and 19%, respectively in the Southern Region, except for electricity, which

was higher in intermediate towns at 21%. Differentials between small and intermediate towns were generally lowest in the Southern Region.

Figure 7.5: Share of households with access to piped water in the home, flush toilets and electricity in intermediate and small towns by region, 2010



Source: Data from NSO and ICF Macro (2010), analysed and presented by author

7.5.3 Comparing environmental health between individual urban centres

The estimates above show that access to piped water in the home, flush toilets and electricity was generally lowest in small towns followed by intermediate towns in all regions. However, when individual urban centres are disaggregated by urban size, a more nuanced picture emerges. Table 7.7 combines the share of households with access to each of these services to rank levels of access between individual urban centres of different sizes and locations. The Table shows that eight small and intermediate towns made the top ten, including Mulanje, Dwangwa, Mtakataka and Thondwe. The intermediate towns of Salima and Nkhotakota also made the top ten along with the primary centre of Blantyre and the secondary town of Zomba, although the other secondary town of Mangochi ranked 26th.

Table 7.7: Urban centres with the best and worse access to piped water, flush toilets and electricity ranked by urban size, 2010

Rank	Town	Piped water in the home (%)	Flush toilets (%)	Electricity (%)	Urban size	Region
1	Mulanje	57.9	68.4	78.9	Small town	Central
2	Dwangwa	0	97.2	100	Small town	Central
3	Zomba	25	37.5	42.5	Secondary town	Southern
4	Mtakataka	0	0	100	Small town	Central
5	Thondwe	0	0	100	Small town	Southern
6	Salima	17.8	18.8	38.6	Intermediate town	Central
7	Nkhotakota	16.4	16.4	40	Intermediate town	Central
8	Blantyre	11.5	14.3	46.3	Primary centre	Southern
9	Mzimba	13.1	14.4	39.5	Intermediate town	Northern
10	Monkey Bay	20.7	6.9	37.9	Small town	Southern
11	Ekwendeni	6.7	3.3	50	Small town	Northern
12	Ntcheu	9.4	11.3	38.3	Small town	Central
13	Lilongwe	9.5	11.8	35	Primary centre	Central
14	Balaka	11.8	9.2	31.6	Intermediate town	Southern
15	Liwonde	12.5	18.8	17.2	Intermediate town	Southern
16	Luchenza	6.5	9.3	32.7	Small town	Southern
17	Bangula	13.4	9	22.4	Small town	Southern
18	Mchinji	0	0	32.4	Small town	Central
19	Rumphi	2.3	6.8	19.3	Small town	Northern
20	Mwanza	2.5	3.4	21.8	Small town	Southern
21	Chitipa	8.1	1.5	17.9	Small town	Northern
22	Nsanje	5.7	3.8	14.2	Intermediate town	Southern
23	Jenda	0	0	21.9	Small town	Northern
24	Karonga Town	4.6	2.8	13.8	Intermediate town	Northern
25	Kasungu	8.1	0	8.1	Intermediate town	Central
26	Mangochi	2.6	0.9	10.6	Secondary town	Central
27	Dedza	1.5	0	11.8	Intermediate town	Central
28	Chilumba	2.6	1.7	8.8	Small town	Northern
29	Nkhata Bay	1.6	1.6	9.8	Small town	Northern
30	Kamwendo	0	0	12.3	Small town	Central
31	Mponela	0	1.5	9	Small town	Central
32	Nchalo	0	0	9.2	Small town	Southern
33	Madisi	1.9	0	4.9	Small town	Central
34	Chintheche	0	0	7.4	Small town	Northern
35	Ulongwe	0	0	1.5	Small town	Southern

Source: Data from NSO and ICF Macro (2010), analysed and presented by author

The Table above also shows that while small and intermediate towns were among the highest ranked, they were also among the lowest ranked, particularly in the Northern Region. Eight small towns dominated the bottom ten, including Chilumba, Nkhata Bay, Kamwendo, Mponela,

Nchalo, Madisi, Chintheche and Ulongwe. Six of these towns had no access to piped water in the home or flush toilets, likely offsetting the high levels of access among the small towns in the top ten. Among intermediate towns, Salima and Nkhotakota were the best performing in their size category, making the top ten, but Karonga Town and Kasungu had the second and third lowest access in their size category, ranked 24th and 25th, respectively. Only Dedza, ranked 27th, performed worse. These variations indicate that levels of service provision vary within each size category, rendering generalisations problematic.

7.6 Limitations

The analysis of the indictors entailed several limitations: spatial uncertainty and misclassification; under-representation; and varying validity.

Spatial uncertainty and misclassification

Because the definition of urban areas used by the NSO was unknown, it was uncertain which of the 44 urban centres included in the sample were defined by the DHS as urban. Table 7.4 above indicates that over 1,500 households in those centres were classified by the DHS as rural. There are two possible explanations for this. First, the sample framework used here was found to include an unknown number of urban centres that the DHS defined as rural. Second, urban clusters could have been misclassified if they were located in rural areas prior to displacement. In such cases, surrounding rural clusters could have been displaced toward urban areas by as much as four kilometres. Conversely, urban clusters could have been displaced by as much as four kilometres into outlying rural areas. Those clusters could have been mistaken as rural. Uncertainty in the spatial data may have therefore resulted in uncertainty in the indicator estimates, despite the efforts to reduce errors outlined above.

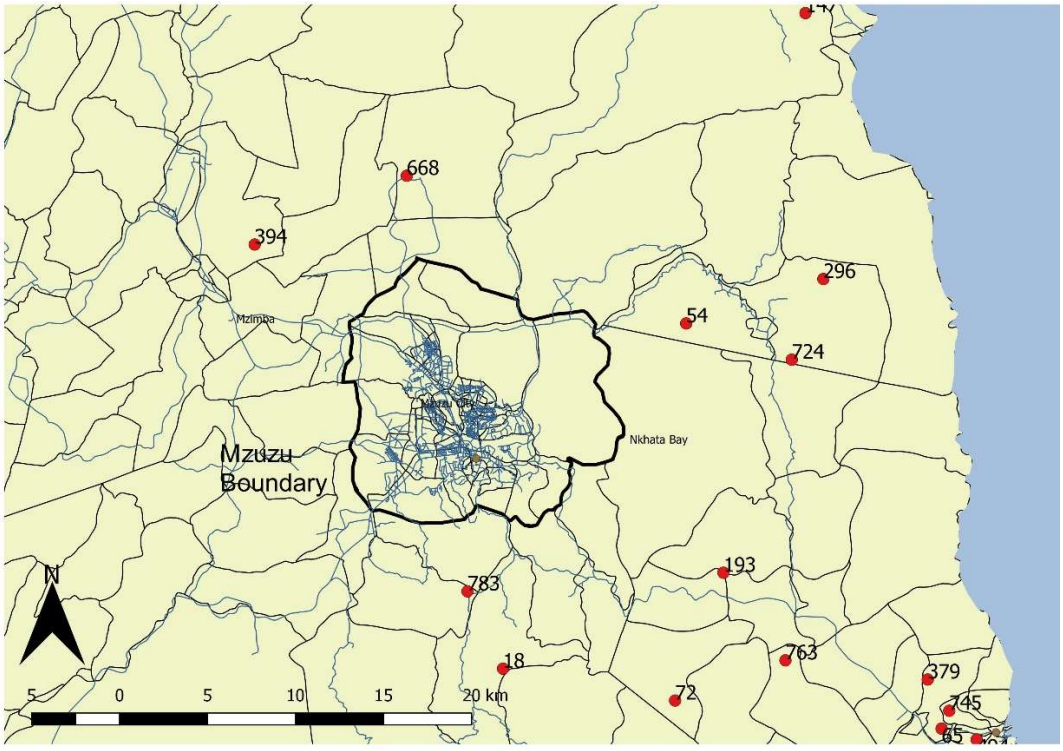
Under-representation

Due to uncertainties in census data, it is possible that more than 44 urban centres with populations greater than 5,000 may have existed in 2008. If so, the sample may under-represent the total urban population, as discussed in Chapter Six (section **Error! Reference source not found.**). The indicator estimates should therefore be treated with caution.

Several urban centres contained either no or few clusters and were therefore less represented than others. Several issues stand out. First, clusters mapped in QGIS show that none were located in Mzuzu (Figure 7.6), suggesting that it was excluded from the sample, even though it is the third largest city, with a population of 133,968 in 2008. Suspiciously, none of the 37 survey

teams for the 2010 DHS were assigned to Mzuzu by name (see NSO and ICF Macro, 2010: 442). Other survey teams were assigned to Lilongwe, Blantyre and Zomba by name. Repeated efforts to contact the NSO to clarify whether Mzuzu was excluded yielded no concrete answers. Consequently, Mzuzu was excluded from the sample, limiting the validity of the indicator estimates for primary centres.

Figure 7.6: Map showing no DHS clusters in Mzuzu



Data source: Spatial information from the Department of Surveys, GPS data of clusters from NSO and ICF Macro (2017), map by author

Second, Zomba (the largest of the two secondary towns) contained only two clusters, representing less than 1% of its population, even though it is the fourth largest city. No other urban centres in the sample were less represented than Zomba, except for those without clusters.

Third, sample sizes for intermediate and small towns varied widely, including some that represented less than 1% of the population, as in the case of the intermediate towns of Kasungu (with a population of 39,640) and Mulanje (with a population of 14,487), to as high as 8% in the case of the small town of Madisi (with a population of 6,884). These differences could be explained if Madisi was oversampled given its relatively small population, but Chitipa (with a

population of 14,753) had a sample that represented 5% of its population, even though it was nearly the same size as Mulanje, whose sample represented 1% of its population. Some urban centres of the same size are therefore better represented than others.

Fourth, several small towns contained only one cluster, including Mulanje, Monkey Bay, Dwangwa, Ekwendeni, Jenda, Thondwe and Mtakataka. While their clusters may have represented their populations relatively well, they may not have represented spatial differentials if the clusters were confined to neighbourhoods that did not accurately reflect the urban situation, as discussed above.

Lastly, eight small towns (Mayaka, Ntchisi, Ngabu, Dowa, Namitete, Chileka, Ntaja, Ulongwe and Mtakataka) had no clusters either because they were defined by the DHS as rural and thus may not have been specifically sampled, or because their clusters were displaced too far into rural areas to be reasonably classified as urban. The indicator estimates for individual urban centres in Table 7.4 above should therefore be treated with caution.

Varying validity of indicator estimates

The validity of the indicator estimates may vary. The indicators for piped water in the home, flush toilets and electricity do not adequately consider safety. For example, piped water in the home does not specify whether supply is reliable or frequently disrupted, forcing households to collect water from unsafe sources, or if pipes have become contaminated through illegal connections; flush toilets do not specify whether provision is adequate or whether excreta is safely disposed of; and access to electricity does not specify whether supply is constant or whether outages are frequent, forcing households to use hazardous biofuels (Satterthwaite 2016b).

The indicators for environmental health outcomes presume that they are causally linked to environmental determinants, despite potential confounding factors. For example, the proxy indicators for diarrhoea could have been caused by other social or environmental determinants. Less valid indicators were therefore excluded, for example, fever is used as a proxy for malaria in the DHS, but it is a typical symptom of childhood illness. Notwithstanding, the indicators were intended to provide a general picture of environmental health rather than to identify causal linkages. The indicators estimates should therefore not be interpreted as conclusive.

7.7 Discussion

The key finding that levels of provision of piped water, flush toilets and electricity connections tend to decline the smaller the urban size corresponds with the findings of Hewett and Montgomery (2001) who analysed DHS data for 31 sub-Saharan African countries, as reviewed in Chapter One (section 1.1.3). It was expected that lower levels of service provision in smaller urban centres would correlate with higher incidences of related environmental health outcomes, but the inverse relationship was observed: under-five mortality rates increased the larger the urban size as did the prevalence of diarrhoeal diseases among children under five years, even though unsanitary conditions combined with poor hygiene are known determinants of these and other environmental health outcomes (Hardoy et al. 2001; Prüss-Üstün and Corvalán 2006). These observations are counterintuitive and suggest that other environmental determinants linked to, for example, density and overcrowding, which tend to be higher in larger urban centres, may be equally if not more significant than access to basic services, particularly where multiple determinants co-exist and compound one another.

The observation that small towns were both among the best and worst served for piped water, flush toilets and electricity connections highlights the need for disaggregated data for individual urban centres of different sizes so that differences between those within the same size category are not obscured. Urban population size alone should therefore not be seen as a universally valid predicator of environmental health. Indeed, some smaller urban centres may have stronger institutional capacities to provide services than others. For instance, the intermediate towns of Mzimba and Salima have local governments and were among those with the highest combined access to piped water, flush toilets and electricity, whereas Karonga Town lacks a local government and was among the poorest served intermediate towns. On the other hand, Kasungu and Dedza both have local governments, but were the two poorest served intermediate towns following Karonga. Thus, the degree to which local governance may be a determinant of environmental health in smaller urban centres, as scholars have long suggested (see Satterthwaite and Tacoli 2003), remains unclear.

Ultimately, more detailed demographic and health data are required to validate the findings due to the inherent limitations of using a national sample survey to analyse population health inequalities at the sub-national scale, as discussed below. For this reason, I am hesitant to draw more definitive conclusions from the findings.

7.8 Conclusion

The analysis in this Chapter marks the first known time the Malawi DHS has been disaggregated for urban populations using a national settlement hierarchy, providing new insight into the degree to which environmental health and its determinants may vary between urban centres of different sizes and locations. The findings revealed inconsistencies concerning whether lower levels of access to water, sanitation and electricity in smaller urban centres necessarily translates into worse environmental health outcomes (measured in terms of diarrhoeal disease and under-five mortality rates). The extent to which other determinants may be combining to shape environmental health outcomes between urban centres of different sizes remains unclear, requiring further research to validate.

Building on the findings above, the following Chapter drills down to the urban scale to analyse the prevalence and distribution of environmental health outcomes through an analysis of hospital records in Karonga Town. Together, these Chapters test longstanding hypotheses concerning the environmental health situation in smaller urban centres based on the Malawian experience.

Chapter 8 Documenting environmental health outcomes in Karonga Town

The findings presented in the previous two Chapters indicate that smaller urban centres in Malawi may be more demographically important than previously thought and that their environmental health situations may be poor on account of their relatively low levels of basic service provision (for water, sanitation and electricity). However, these findings provide a broad picture of urban growth and environmental health dynamics at different levels of the urban hierarchy and are not detailed enough to make accurate conclusions for individual urban centres.

This Chapter drills down to the urban scale through a longitudinal analysis of environmental health outcomes in Karonga Town based on inpatient hospital records collected from Karonga District Hospital between August 2016 and July 2017, addressing the third research objective:

- To document environmental health outcomes and their socio-spatial distribution in Karonga Town through an analysis of hospital records.

The hospital records were augmented by an analysis of data on staff shortages supplied by the District Environmental Health Officer (DEHO) to assess the hospital's current human resource capacity in relation to the town's growth. The specific objectives are:

- To assess the extent to which the hospital is able to meet the demands of the town's rapidly growing population;
- To assess the relative importance of the environment for health;
- To assess the relative importance of different environmental hazards (everyday, small and large) for health;
- To assess the extent to which environmental health outcomes change seasonally or following environmental hazard events (disasters and disease epidemics);
- To assess the social distribution of environmental health outcomes by age and sex; and
- To compare the spatial distribution of environmental health outcomes between villages and between the old and new town boundary.

A key limitation of analysing hospital records is that they are not entirely representative of the town's population for the reasons outlined in Chapter Four (section 4.6.3).. While the sample has limitations, the findings provide initial insight into the prevalence and socio-spatial distribution of health conditions with known environmental causes/contributions (i.e.

environmental health problems) in the town's population based on the urban inpatient population. The following Chapter presents ethnographic insights into the likely determinants of the environmental health problems identified in this Chapter as most prevalent. Both of these Chapters thus address the third research objective.

The Chapter is comprised of five sections. Section one begins by outlining the structure of the public health system in Karonga District, the roles that Karonga District Hospital plays in health care, and the human resource capacity shortfalls it faces. This section draws primarily on data provided by the DEHO and supplementary field notes. Section two presents the findings of the hospital records, and section three discusses their significance. Section four outlines the limitations of the analysis, while section five concludes. The main findings are synthesised in Chapter Eleven (section **Error! Reference source not found.**).

8.1 The institutional structure of public health in Karonga District

Malawi has a decentralised health care delivery system based on three tiers (field notes, 2017). The first tier delivers primary health care geared toward health prevention activities at the community level. Services are delivered at dispensaries, community health centres/posts, maternity units and hospitals, and through community-based initiatives. The second tier includes District Hospitals geared toward inpatient and outpatient care, and community health services. This tier delivers specialised services (diagnostic, laboratory, blood bank, rehabilitation, physiotherapy). The third tier delivers tertiary health care geared toward highly specialised services provided by central hospitals and other specialist facilities that cater to specific health conditions among patients with specific needs (e.g. the elderly, the disabled).

Each tier is linked through a referral system at the district, regional and national scales. Karonga District Hospital serves as a referral facility for Karonga District, which includes 19 different public health facilities (field notes, 2017). The Central Hospital in Mzuzu serves as a referral facility for the Northern Region as a whole. Because Karonga District Hospital is located in the town (major public facilities are usually located in urban centres), the hospital functions both as a local health care facility for urban residents and as a referral facility for the entire District. The only other outreach health facilities in the town are the clinic at the former hospital in old town, and the Kachila and Lusubilo community outreach centres in the town centre.

The town's rapid growth has increased pressure on the hospital's already constrained capacity. Data provided by the DEHO indicate that while the hospital was originally designed for 208 beds in 1985, around 300 inpatients are admitted each month. Consequently, some patients are

forced to share beds, while others are allocated to available spaces in corridors. The data also indicate staff shortages (Table 8.1). While the hospital currently employs 81 health workers, the DEHO estimates a total shortfall of 201 as of July 2017. Since November 2011, the hospital has lost 18 medical assistants, 21 nurses and 8 Health Surveillance Assistants (HSAs), but has gained 11 clinical officers. The number of medical doctors has remained the same (field notes, 2017).

Table 8.1: Health worker deficits at Karonga District Hospital, July 2017

Type of Health Worker	Number employed	Shortfall
Medical Doctors	2	6
Clinical Officers	25	62
Medical Assistants	3	13
Nurses	51	120
Total	81	201

Source: Karonga District Hospital under the Ministry of Health, compiled by author

According to the DEHO (field notes, 2017), HSAs are intended to serve populations of around 1,000, but some are serving as many as 7,000. While 170 HSAs were employed as of May 2017, 348 were required, amounting to a shortfall of 178 (Table 6.2). Due to a hiring freeze, the Ministry of Health has suspended all staff recruitment, meaning that vacancies are not being filled at all levels. Meanwhile, many HSAs have quit to pursue other opportunities (nursing degrees), while others have retired. Consequently, staff shortages for HSAs are increasing at a time of continuing population growth, jeopardising the vital role they play in serving as a bridge between communities and the formal health care system, as discussed in Chapter Four (section **Error! Reference source not found.**).

Table 8.2: Staff shortfalls under the DEHO, May 2017

Position	Required number of staff	Actual number of staff	Staff shortfall
DEHO	1	1	0
Senior Environmental Health Officer	1	1	0
Environmental Health Officer	3	3	0
Senior Assistant Environmental Health Officer	1	1	0
Assistant Environmental Health Officer	6	4	2
Senior HSAs	50	46	4
HSAs	348	170	178
Total	410	226	184

Figures provided by the DEHO, May 2017, compiled by author

8.2 Environmental health outcomes in Karonga Town: Key findings

Valid hospital records for all urban inpatients (defined as those who currently live in villages located in the old and new town boundary) were collected from the hospital over a 12-month period between August 2016 and July 2017 from the hospital based on the methodology outlined in Chapter Four (section **Error! Reference source not found.**). Analysis of these records yielded the following key findings:

8.2.1 The composition of the urban inpatient population

Approximately 10,100 inpatients were admitted to the female, male and paediatric wards between August 2016 and July 2017 (Table 8.3). In total, 4,489 inpatients were urban (their home village was located either in the old or new town boundary), accounting for 44% of the entire inpatient population. However, of all urban inpatient records, 1,494 were deemed invalid either because they contained missing information or record keeping errors, including illegibility. They were excluded from the sample as result. Ultimately, 30% of the entire inpatient population was urban and had valid hospital records. Only urban inpatients with valid records were sampled.

Table 8.3: The urban inpatient population in Karonga Town (new town boundary), August 2016-July 2017

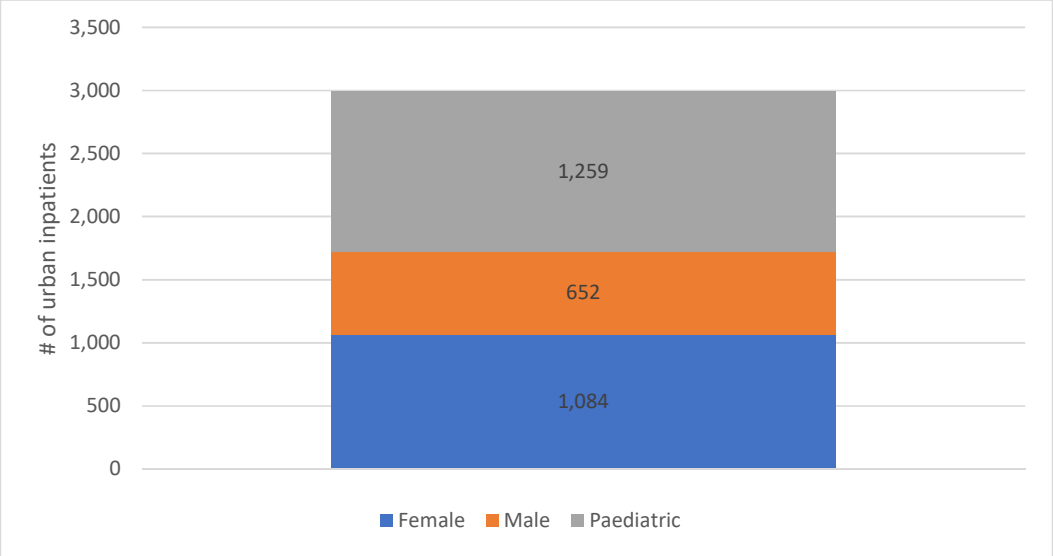
	Valid urban cases (no errors)	All urban cases (with and without errors)	Cases with errors	~ Total cases in district[1]
Female ward	1,084	1,652	568	3,283
Male ward	652	1,071	419	2,374
Paediatric ward	1,259	1,766	507	4,443
Total	2,995	4,489	1,494	10,100
%	30%	44%	15%	100%

Source: Inpatient registers from the female, male and paediatric wards at Karonga District Hospital (2017) under the Ministry of Health, compiled and analysed by author

[1]The hospital records contained numerous errors in case numbers. The total number of cases in the district are therefore approximate.

Of all urban inpatients, 42% to the paediatric ward, followed by 36% admitted to the female ward, followed by and 22% to the male ward (Figure 8.1).

Figure 8.1: Number of urban inpatients by ward, August 2016-July 2017

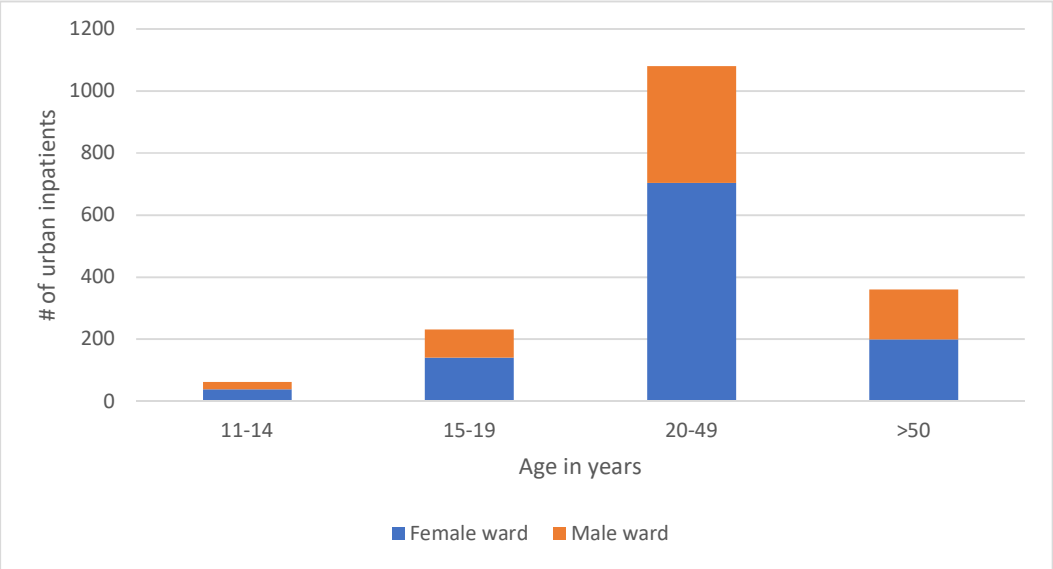


Source: Inpatient registers from the female, male and paediatric wards at Karonga District Hospital (2017) under the Ministry of Health, compiled and analysed by author

The largest number of admissions for both females and males occurred between the ages of 20 and 49 and 50 years or older (Figure 8.2). In the female ward, 65% inpatients were between the ages of 20-49, followed by 18% who were 50 years and above. Inpatients in the male ward

displayed a similar pattern; 56% were between the ages of 20-49 years, followed by 25% who were 50 years or above.

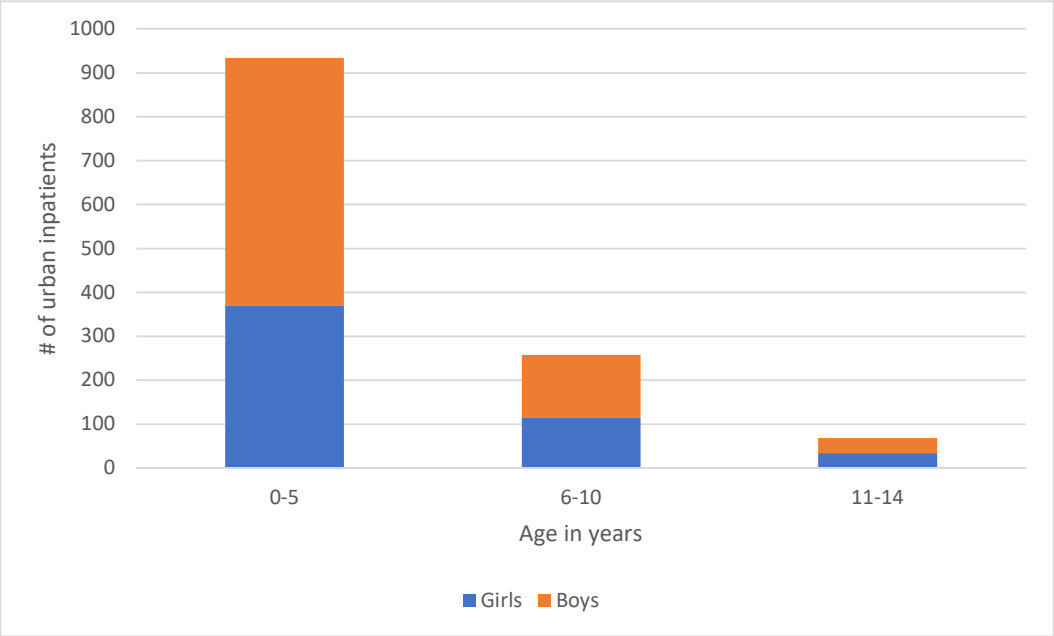
Figure 8.2: Age composition of urban inpatients by female and male wards, August 2016-July 2017



Source: Inpatient registers from the female, male and paediatric wards at Karonga District Hospital (2017) under the Ministry of Health, compiled and analysed by author

The largest number of admissions to the paediatric ward occurred for both girls and boys 5 years old and under at 74% followed by 20% between the ages of 6-10 years (Figure 8.3). Boys were the largest inpatient admission group at 59%.

Figure 8.3: Age and sex composition of urban inpatients in the paediatric ward, August 2016-July 2017



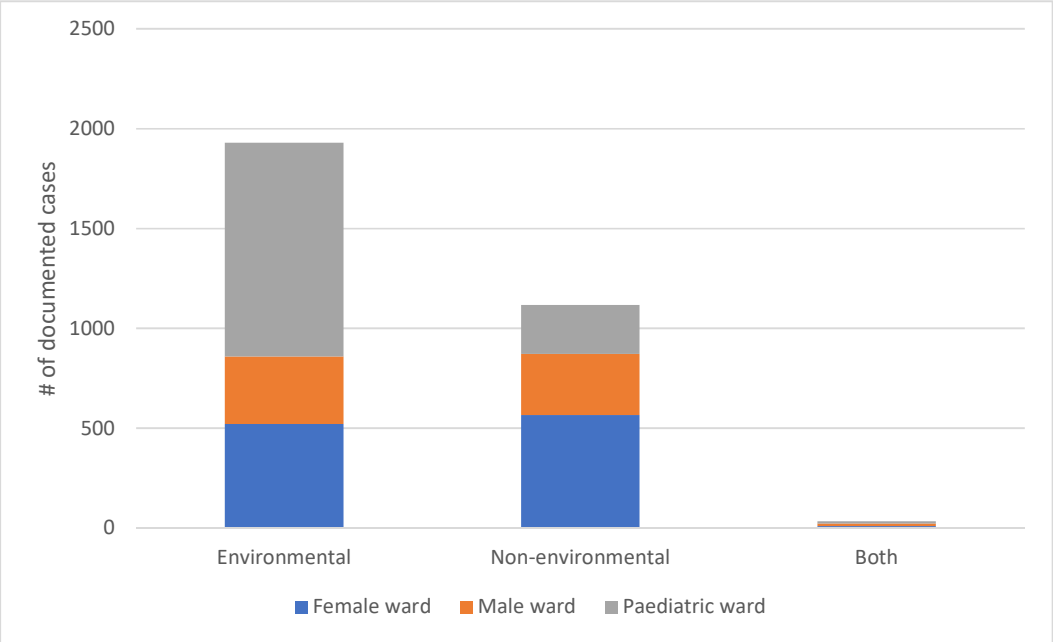
Source: Inpatient registers from the female, male and paediatric wards at Karonga District Hospital (2017) under the Ministry of Health, compiled and analysed by author

8.2.2 The relative importance of the environment for health

Diseases and health conditions with known environmental causes (termed environmental health outcomes) were identified using the environmental health matrix outlined in Chapter Four (section **Error! Reference source not found.**). Figure 8.4 indicates that environmental health outcomes accounted for 63% of all reported diseases and health conditions, and that a relatively small shall share of cases had diseases and health conditions with both environmental and non-environmental causes.

A number of records also reported two or more environmental health problems with similar symptoms (pneumonia/tuberculosis was among the most common). Clinicians indicated that multiple diagnoses are common in cases where the doctor on duty is unsure of a primary cause (field notes, 2017). In other cases, records contained diagnosis for multiple concurrent conditions (e.g. malaria and tuberculosis). In all cases, each diagnosis was recorded, meaning that the number of recorded cases exceeds the total urban inpatient population. The main interest here was on the prevalence of environmental disease in the population, hence the inclusion of all reported conditions.

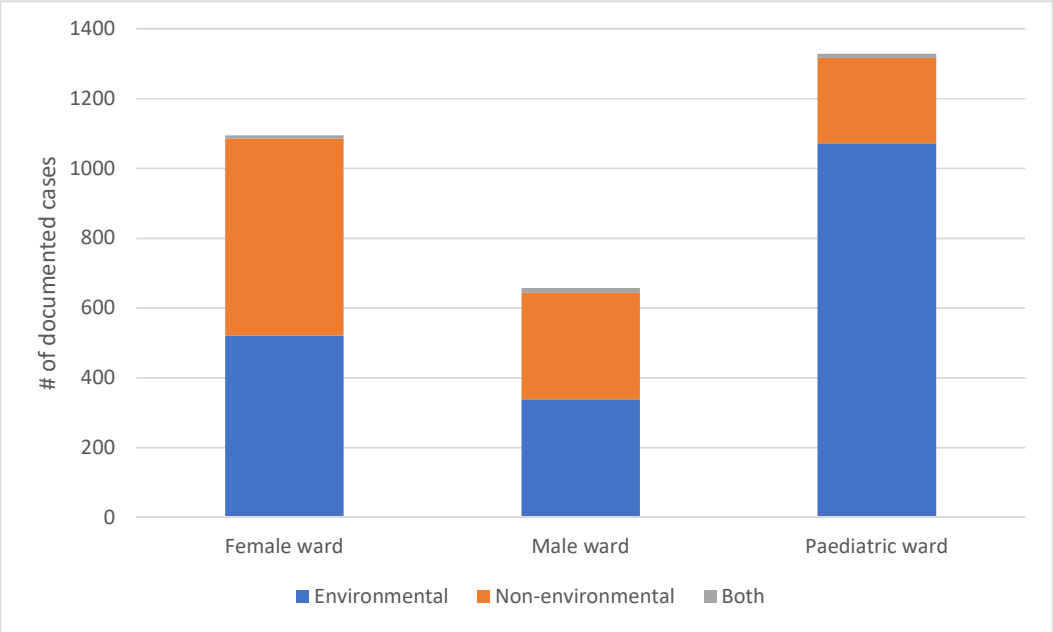
Figure 8.4: The prevalence of environmental health outcomes in the urban inpatient population, August 2016-July 2017



Source: Inpatient registers from the female, male and paediatric wards at Karonga District Hospital (2017) under the Ministry of Health, compiled and analysed by author

Figure 8.5 indicates that environmental health problems were most prevalent in the paediatric ward at 81%. In addition, the paediatric ward accounted for the largest share of all environmental health outcomes at 56% followed by the female ward at 27% and the male ward at 18%.

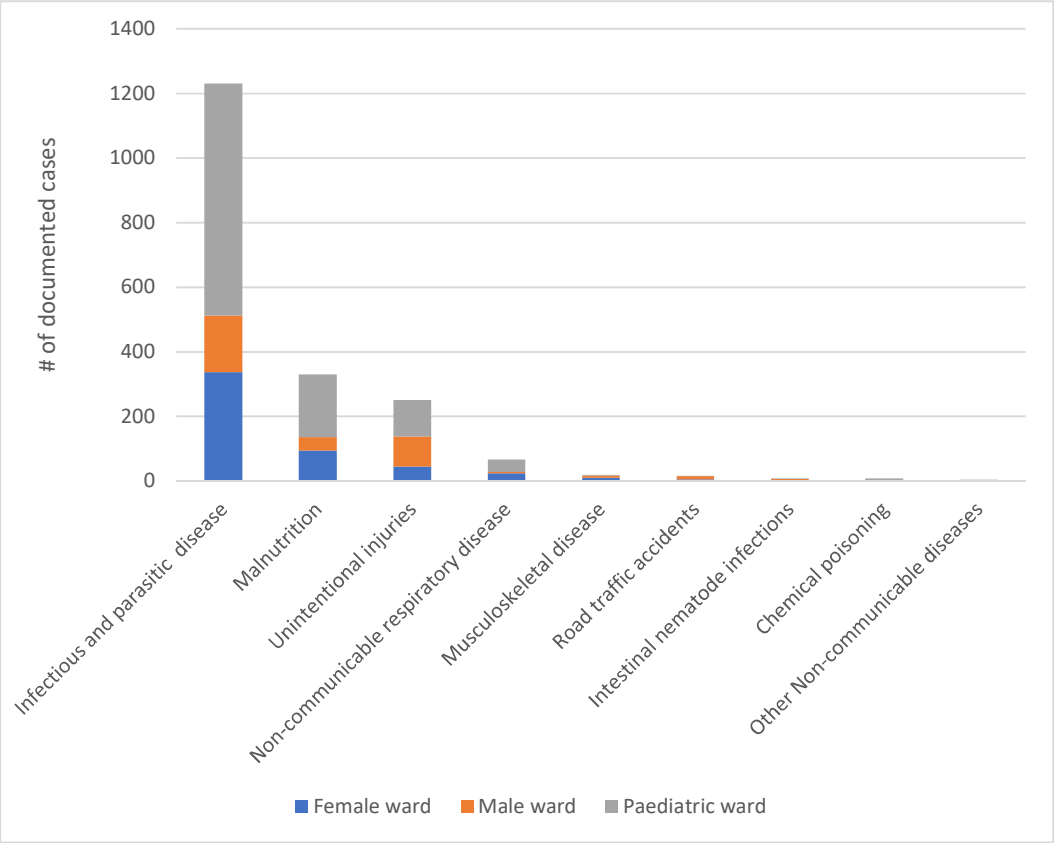
Figure 8.5: The prevalence of environmental health outcomes by ward, August 2016-July 2017



Source: Inpatient registers from the female, male and paediatric wards at Karonga District Hospital (2017) under the Ministry of Health, compiled and analysed by author

Figure 8.6 indicates that environmental health outcomes were dominated by infectious and parasitic diseases (namely malaria, acute respiratory infections and diarrhoeal disease) at 64%, followed by malnutrition (namely anaemia) at 17%. The paediatric ward accounted for the largest share of environmental health outcomes, as noted above, except for intestinal nematode infections, musculoskeletal disease and other non-communicable diseases (e.g. lung cancer, chronic obstructive pulmonary disease (COPD)).

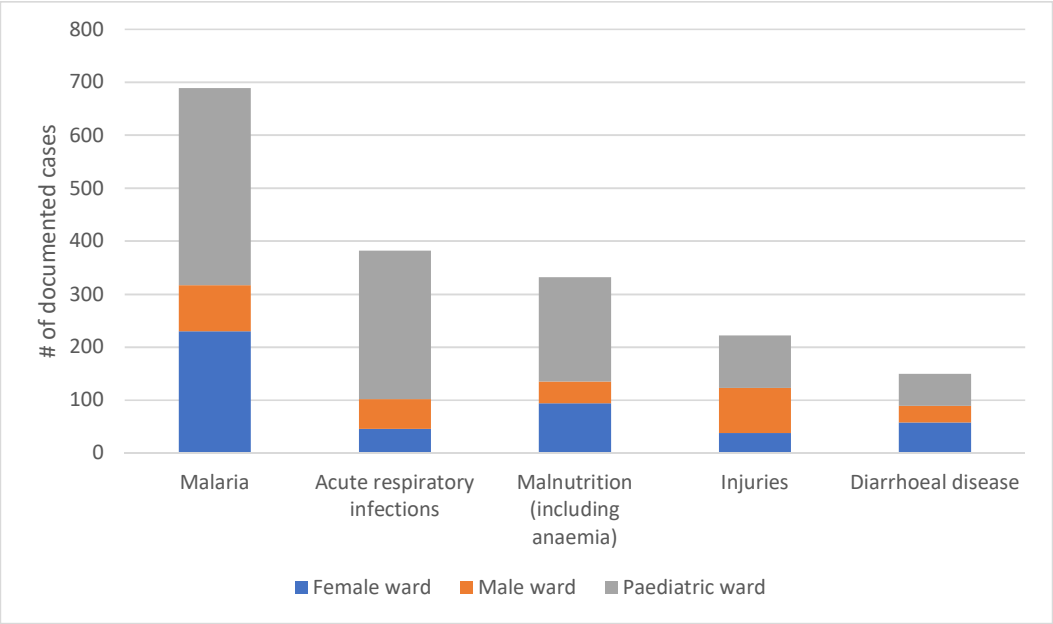
Figure 8.6: The prevalence of specific environmental health outcomes, August 2016-July 2017



Source: Inpatient registers from the female, male and paediatric wards at Karonga District Hospital (2017) under the Ministry of Health, compiled and analysed by author

Figure 8.7 shows that the top five environmental health outcomes accounted for 93% of all environmental health outcomes led by malaria, followed by acute respiratory infections (namely pneumonia, tuberculosis, bronchitis and other unspecified conditions). Of all acute respiratory infections, pneumonia was the most prevalent, accounting for 86% of all cases.

Figure 8.7: Top five environmental health outcomes by ward, August 2016-July 2017



Source: Inpatient registers from the female, male and paediatric wards at Karonga District Hospital (2017) under the Ministry of Health, compiled and analysed by author

The top five environmental health outcomes were most prevalent in the paediatric ward (Table 8.4).

Table 8.4: Share of top five environmental diseases in each ward, August 2016-July 2017

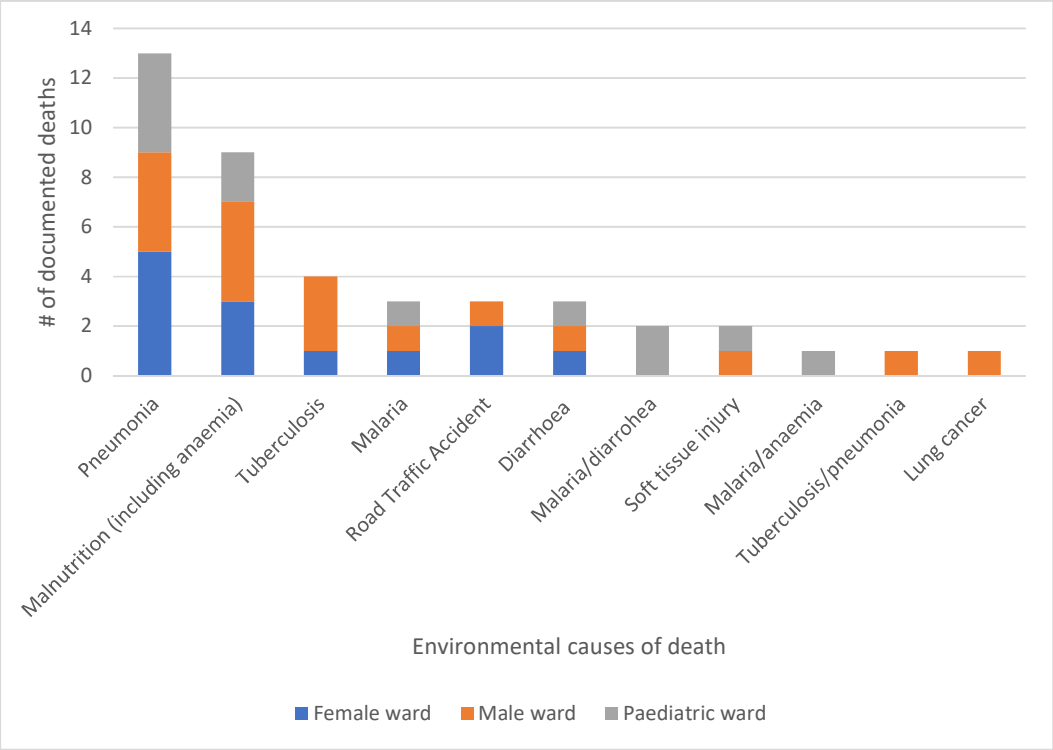
	Female ward	Male ward	Paediatric ward	Total cases	% of total cases
Malaria	33% (230 cases)	13% (87 cases)	54% (372 cases)	689	39%
Acute respiratory infections	12% (46 cases)	15% (56 cases)	73% (280 cases)	382	22%
Malnutrition	28% (94 cases)	12% (41 cases)	59% (197 cases)	332	19%
Injuries	17% (38 cases)	38% (85 cases)	44% (99 cases)	222	13%
Diarrhoeal disease	39% (58 cases)	21% (31 cases)	41% (61 cases)	150	8%
Total cases	466	300	1,009	1,775	100%

Source: Inpatient registers from the female, male and paediatric wards at Karonga District Hospital (2017) under the Ministry of Health, compiled and analysed by author

8.2.3 Mortality burden attributable to environmental causes

The mortality burden attributable to environmental causes accounted for 38% of the entire mortality burden in the urban inpatient population (Figure 8.8). The top environmental cause was pneumonia accounting for 28% of all deaths, followed by malnutrition at 21%. The mortality burden was highest in the male ward at 40%, followed by the female ward at 31%.

Figure 8.8: The annual mortality burden attributable to environmental causes, August 2016-July 2017

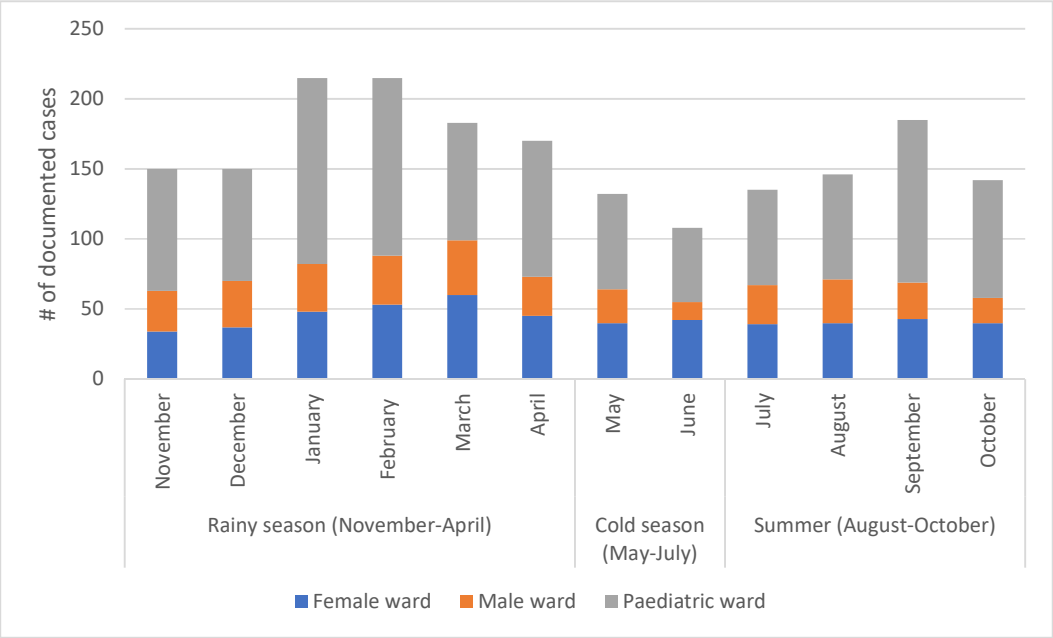


Source: Inpatient registers from the female, male and paediatric wards at Karonga District Hospital (2017) under the Ministry of Health, compiled and analysed by author

8.2.4 The impact of seasonal changes on health

Figure 8.9 shows the impact of seasonal changes on environmental health outcomes in the urban inpatient population. The results indicate that the rainy season accounted for the largest share at 56%, followed by the summer season at 25%, and the cold season at 19%. In particular, January and March accounted for the largest share of environmental health outcomes in the rainy season at 11%, respectively, accounting for 22% of all cases combined.

Figure 8.9: Impact of seasonal changes on all environmental health outcomes, August 2016-July 2017



Source: Inpatient registers from the female, male and paediatric wards at Karonga District Hospital (2017) under the Ministry of Health, compiled and analysed by author

Table 8.5 indicates that the paediatric ward accounted for most environmental health outcomes in each season, ranging from 50% to 58%. The male ward accounted for the smallest share and remained relatively constant between 16% and 18%, while the female ward accounted for between 26% and 32% of environmental health outcomes.

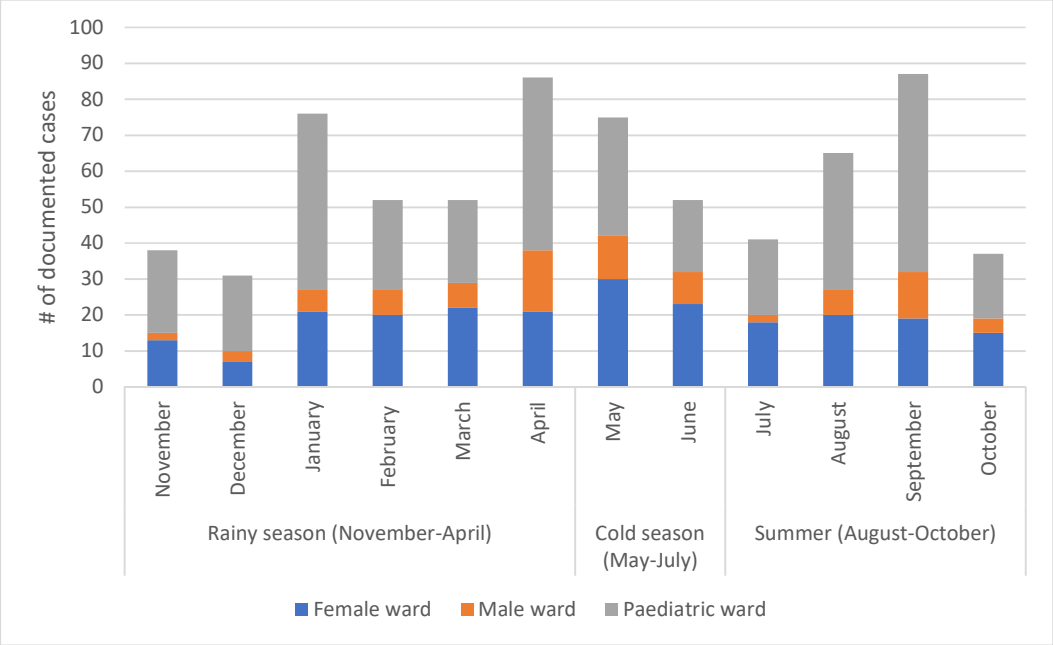
Table 8.5: Share of seasonal environmental disease by ward, August 2016-July 2017

	Rainy season	Cold season	Summer
Female ward	26% (277 cases)	32% (121 cases)	26% (123 cases)
Male ward	18% (198 cases)	17% (65 cases)	16% 75 cases)
Paediatric ward	56% (608 cases)	50% (189 cases)	58% (275 cases)

Source: Inpatient registers from the female, male and paediatric wards at Karonga District Hospital (2017) under the Ministry of Health, compiled and analysed by author

Figure 8.10 indicates that the rainy season accounted for the largest share of malaria cases at 48%, followed by the summer season at 27%, and the cold season at 24%. January and April accounted for most cases during the rainy season.

Figure 8.10: Impact of seasonal changes on malaria, August 2016-July 2017



Source: Inpatient registers from the female, male and paediatric wards at Karonga District Hospital (2017) under the Ministry of Health, compiled and analysed by author

Table 8.6 indicates that the paediatric ward accounted for the largest share of malaria in each season, while the male ward accounted for the smallest share.

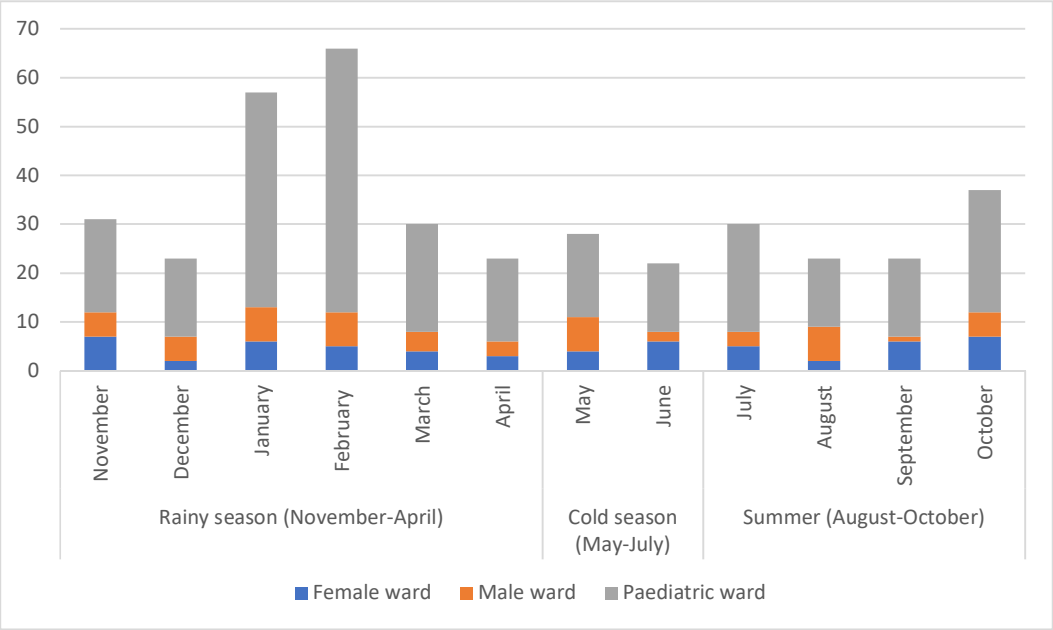
Table 8.6: Share of seasonal malaria by ward, August 2016-July 2017

	Rainy season	Cold season	Summer
Female ward	31% (104 cases)	42% (71 cases)	27% (54 cases)
Male ward	13% (42 cases)	14% (23 cases)	13% (24 cases)
Paediatric ward	56% (189 cases)	44% (74 cases)	59% (111 cases)

Source: Inpatient registers from the female, male and paediatric wards at Karonga District Hospital (2017) under the Ministry of Health, compiled and analysed by author

Figure 8.11 indicates that the rainy season accounted for the largest share of acute respiratory infections at 59%, followed by the summer season at 21%, and the cold season at 20%. January and February accounted for the most cases during the rainy season.

Figure 8.11: Impact of seasonal changes on acute respiratory infections, August 2016-July 2017



Source: Inpatient registers from the female, male and paediatric wards at Karonga District Hospital (2017) under the Ministry of Health, compiled and analysed by author

Table 8.7 indicates that the paediatric ward accounted for the largest share of acute respiratory infections in each season, while the male ward accounted for the smallest share of cases in the cold and summer seasons. However, the male ward accounted for a slightly larger share of acute respiratory infections during the rainy season than the female ward.

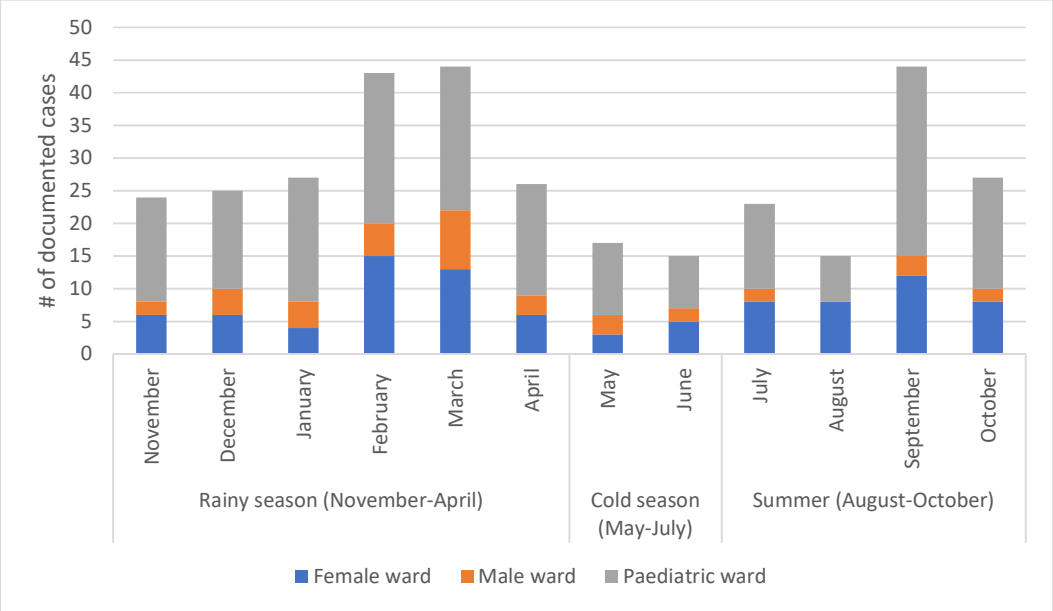
Table 8.7: Share of seasonal acute respiratory infections by ward, August 2016-July 2017

	Rainy season	Cold season	Summer
Female ward	12% (27 cases)	19% (15 cases)	18% (15 cases)
Male ward	14% (31 cases)	15% (12 cases)	16% (13 cases)
Paediatric ward	75% (172 cases)	66% (53 cases)	66% (55 cases)

Source: Inpatient registers from the female, male and paediatric wards at Karonga District Hospital (2017) under the Ministry of Health, compiled and analysed by author

Figure 8.12 indicates that rainy season accounted for the largest share of cases of malnutrition (including cases of anaemia) at 57%, followed by the summer season at 26%, and the cold season at 17%. February and March accounted for most cases during the rainy season.

Figure 8.12: Impact of seasonal changes on malnutrition, August 2016-July 2017



Source: Inpatient registers from the female, male and paediatric wards at Karonga District Hospital (2017) under the Ministry of Health, compiled and analysed by author

Table 8.8 indicates that the paediatric ward accounted for the largest share of malnutrition in each season, while the male ward accounted for the smallest share of cases during the summer season, followed by the cold and rainy seasons.

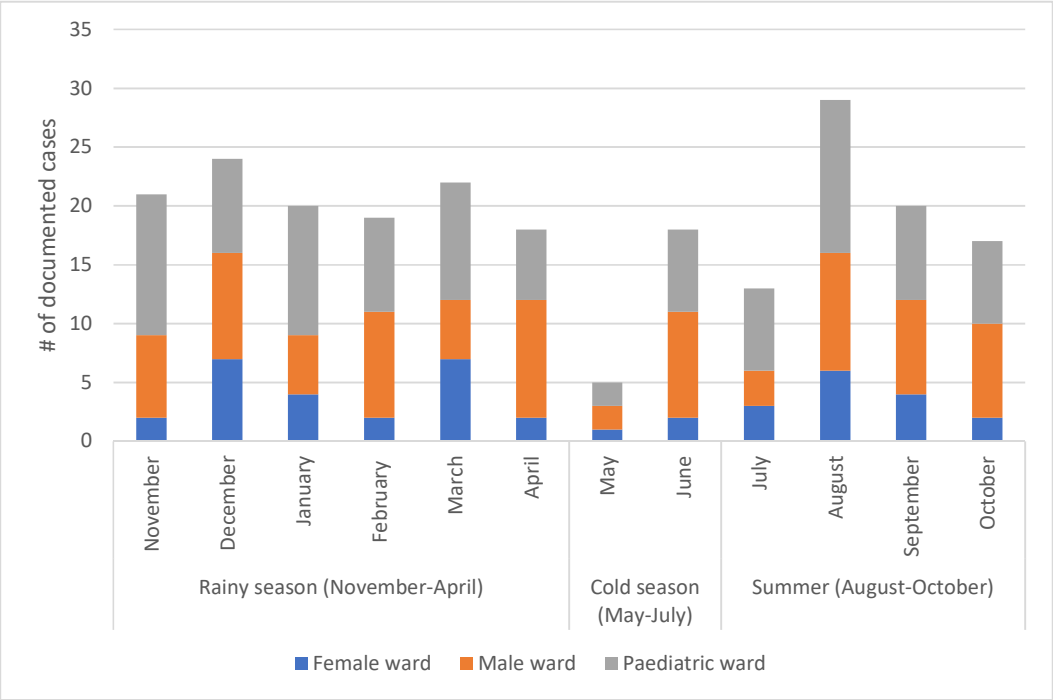
Table 8.8: Share of seasonal malnutrition by ward, August 2016-July 2017

	Rainy season	Cold season	Summer
Female ward	27% (50 cases)	29% (16 cases)	33% (28 cases)
Male ward	14% (27 cases)	13% (7 cases)	6% (5 cases)
Paediatric ward	59% (112 cases)	58% (32 cases)	62% (53 cases)

Source: Inpatient registers from the female, male and paediatric wards at Karonga District Hospital (2017) under the Ministry of Health, compiled and analysed by author

Figure 8.13 indicates that rainy season accounted for the largest share of injuries at 55%, followed by the summer season at 29%, and the cold season at 16%. December and March accounted for a slightly larger share of cases during the rainy season.

Figure 8.13: Impact of seasonal changes on injuries, August 2016-July 2017



Source: Inpatient registers from the female, male and paediatric wards at Karonga District Hospital (2017) under the Ministry of Health, compiled and analysed by author

Table 8.9 indicates that the paediatric ward accounted for the largest share of injuries in each season, while the female ward accounted for the smallest share of injuries in the cold and summer seasons. Male injuries remained fairly constant throughout the year, ranging from 36% to 39%.

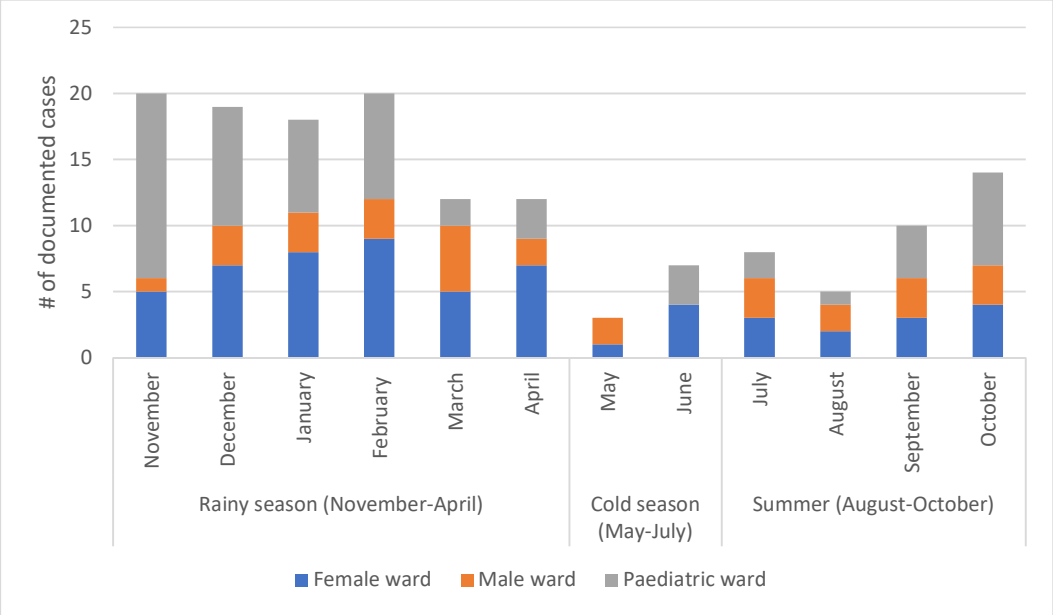
Table 8.9: Share of seasonal injuries by ward, August 2016-July 2017

	Rainy	Cold	Summer
Female ward	19% (24 cases)	17% (6 cases)	18% (12 cases)
Male ward	36% (45 cases)	39% (14 cases)	39% (26 cases)
Paediatric ward	44% (55 cases)	44% (16 cases)	42 (28 cases)

Source: Inpatient registers from the female, male and paediatric wards at Karonga District Hospital (2017) under the Ministry of Health, compiled and analysed by author

Figure 8.14 indicates that rainy season accounted for the largest share of diarrhoeal disease at 68%, followed by 20% of cases in the summer season and 12% of cases in the cold season. March and April accounted for the smallest share of cases during the rainy season.

Figure 8.14: Impact of seasonal changes on diarrhoeal disease, August 2016-July 2017



Source: Inpatient registers from the female, male and paediatric wards at Karonga District Hospital (2017) under the Ministry of Health, compiled and analysed by author

Table 8.10 indicates that the paediatric ward accounted for the largest share of diarrhoeal disease in the rainy and summer seasons. However, the female ward accounted for the largest share of diarrhoeal disease in the cold season. The male ward accounted for the smallest share of diarrhoeal disease in each season.

Table 8.10: Share of seasonal diarrhoeal by ward, August 2016-July 2017

	Rainy	Cold	Summer
Female ward	41% (41 cases)	44% (8 cases)	31% (9 cases)
Male ward	17% (17 cases	28% (5 cases)	28% (8 cases)
Paediatric ward	43% (43 cases)	28% (5 cases)	41% (12 cases)

Source: Inpatient registers from the female, male and paediatric wards at Karonga District Hospital (2017) under the Ministry of Health, compiled and analysed by author

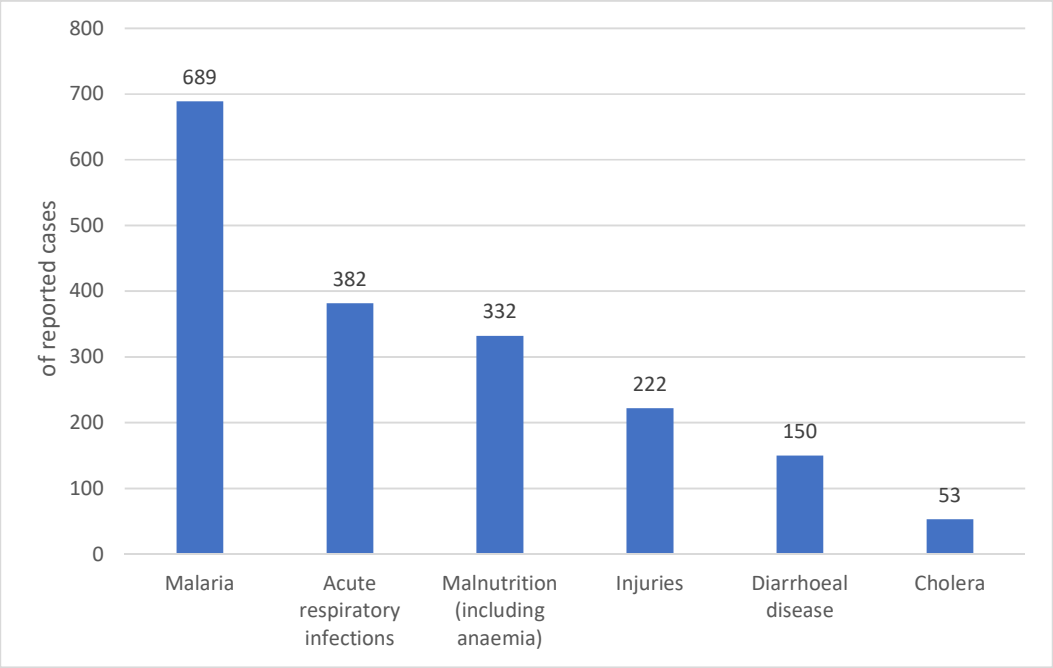
8.2.5 The relative impact of disaster events on environmental health

Fortunately, there was only one large-scale disaster event in the form of a cholera outbreak that occurred between January and December 2016. There were also two small seasonal floods that occurred on the 1 April and 17 April 2017; however, many hospital records only included the month and year inpatients were admitted. Consequently, it was not possible to attribute environmental health outcomes to time-bounded events. It was nevertheless possible to

analyse the importance of the cholera outbreak relative to everyday environmental health outcomes. To facilitate this analysis, the top five environmental health problems served as sentinel indicators.

Between 1 January 2016 and 22 July 2016, 237 people with symptoms of cholera were treated at Karonga District Hospital. Among them, 53 came from villages in the town, accounting for 23% of all cases. By comparison, 1,931 environmental health outcomes led by malaria were reported in the urban inpatient population between August 2016 and July 2017 (Figure 8.15). Overall, cholera cases accounted for only 3% of the total annual urban environmental morbidity burden during the study period.

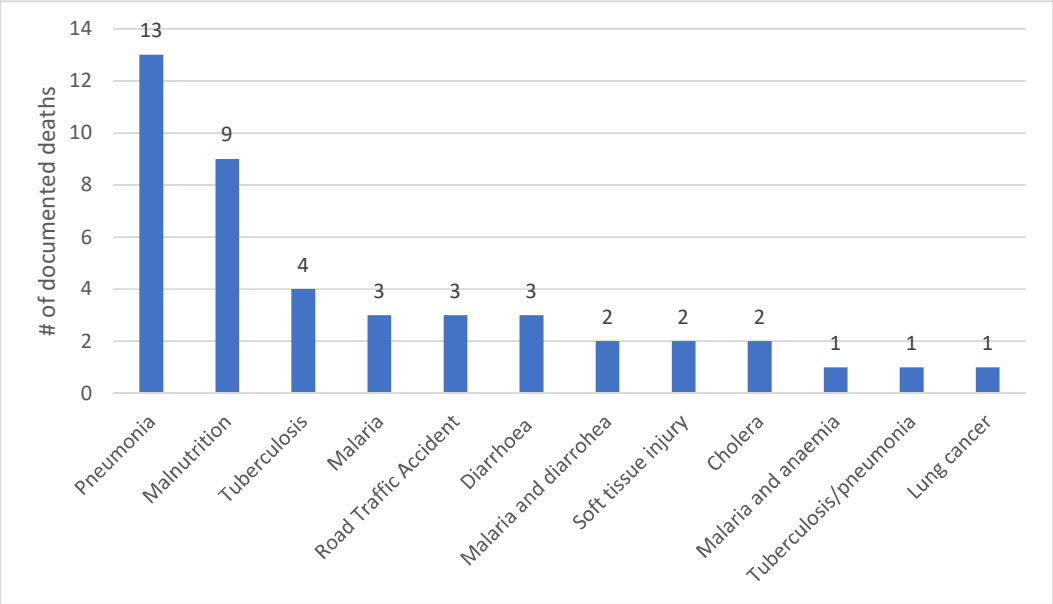
Figure 8.15: Top five everyday environmental health outcomes (August 2016-July 2017) versus cholera (January-July 2016)



Source: Inpatient registers from the female, male and paediatric wards at Karonga District Hospital (2017) under the Ministry of Health, compiled and analysed by author

Of the 53 people who were infected with cholera, two died, including a 65-year-old man and a 21-year-old man from Mwanyesha. In contrast, 44 people died from environmental causes between August 2016 and July 2017, led by pneumonia and malnutrition (Figure 8.16). Overall, the cholera outbreak accounted for 4% of the annual urban environmental mortality burden.

Figure 8.16: Number of deaths attributable to everyday environmental causes relative to those attributable to cholera, August 2016-July 2017

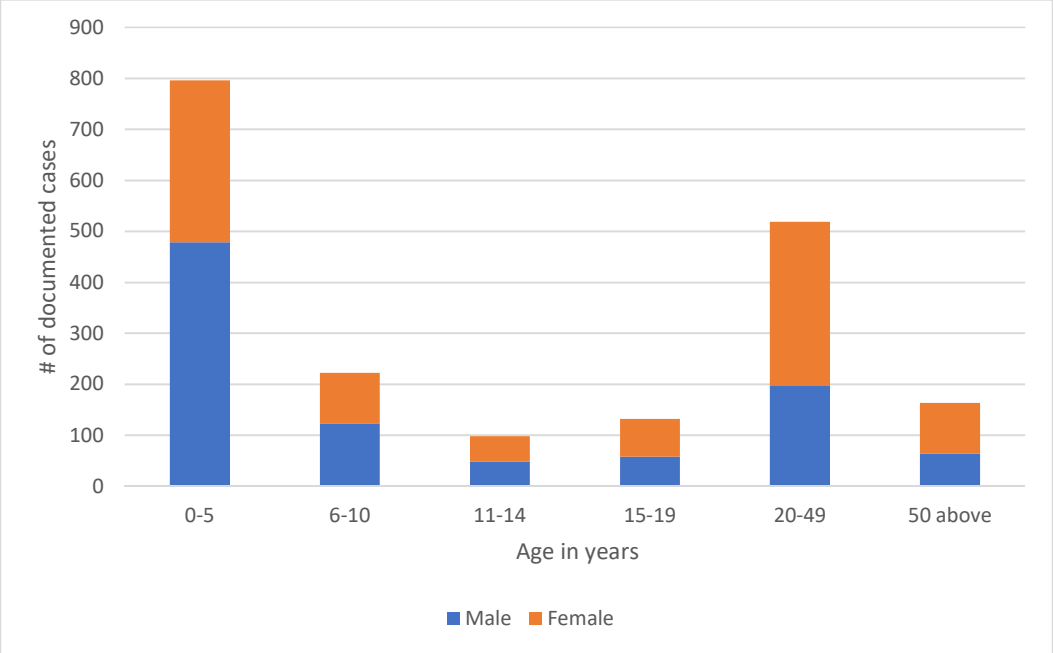


Source: Inpatient registers from the female, male and paediatric wards at Karonga District Hospital (2017) under the Ministry of Health, compiled and analysed by author

8.2.6 The impact of age and sex on environmental health

The distribution of environmental health outcomes in the urban inpatient population was relatively even based on sex; males accounted just over half of all cases. Figure 8.11 indicates that inpatients five years and under accounted for the largest share of environmental health outcomes at 41%, followed by inpatients between the ages of 20-49 years at 27%.

Table 8.11: Environmental disease disaggregated by age and sex, August 2016-July 2017



Source: Inpatient registers from the female, male and paediatric wards at Karonga District Hospital (2017) under the Ministry of Health, compiled and analysed by author

Table 8.12 indicates that the distribution of environmental health outcomes by age was biased toward males 10 years old or below, and biased toward females between the ages of 11 and 50 years old and above.

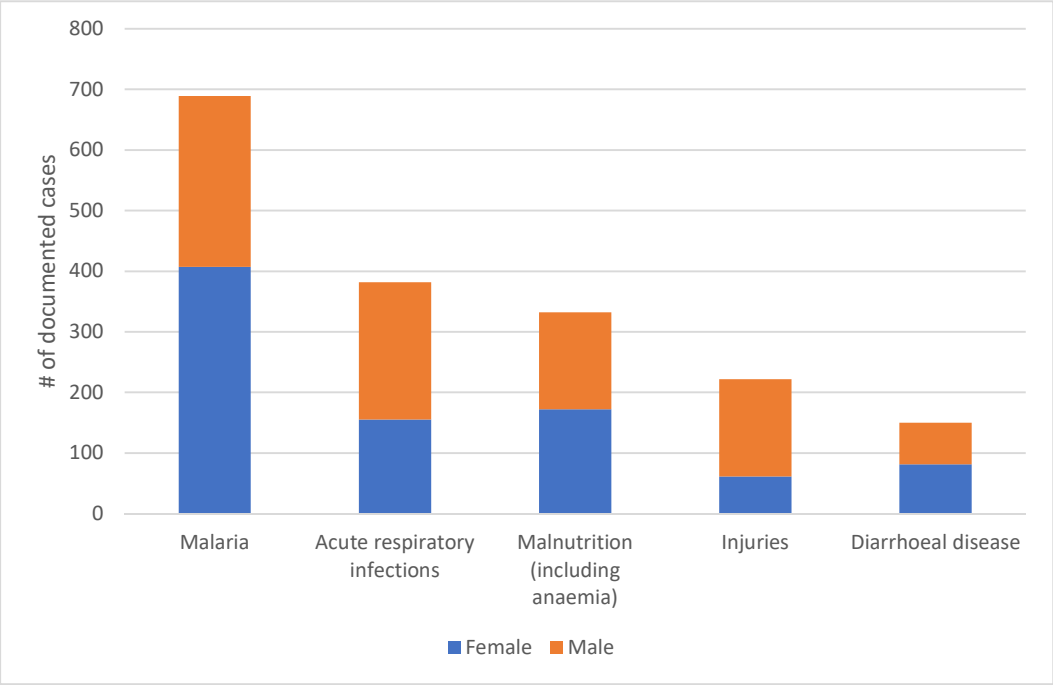
Table 8.12: Distribution of the environmental health outcomes by age and sex, August 2016-July 2017

	0-5 years	6-10 years	11-14 years	15-19 years	20-49 year	50 above years
Male	60% (479)	55% (123)	49% (48)	44% (58)	38% (198)	39% (64)
Female	40% (317)	45% (99)	51% (50)	56% (74)	62% (321)	61% (100)
Total cases	796	222	98	132	519	164

Source: Inpatient registers from the female, male and paediatric wards at Karonga District Hospital (2017) under the Ministry of Health, compiled and analysed by author

Figure 8.17 also indicates that the distribution of the top five environmental health outcomes was relatively even based on sex, except for injuries, which were biased toward males.

Figure 8.17: Top five environmental diseases disaggregated by sex, August 2016-July 2017



Source: Inpatient registers from the female, male and paediatric wards at Karonga District Hospital (2017) under the Ministry of Health, compiled and analysed by author

Table 8.13 indicates that males accounted for the largest share of acute respiratory infections and injuries, whereas females accounted for the largest share of malaria, malnutrition and diarrhoeal disease.

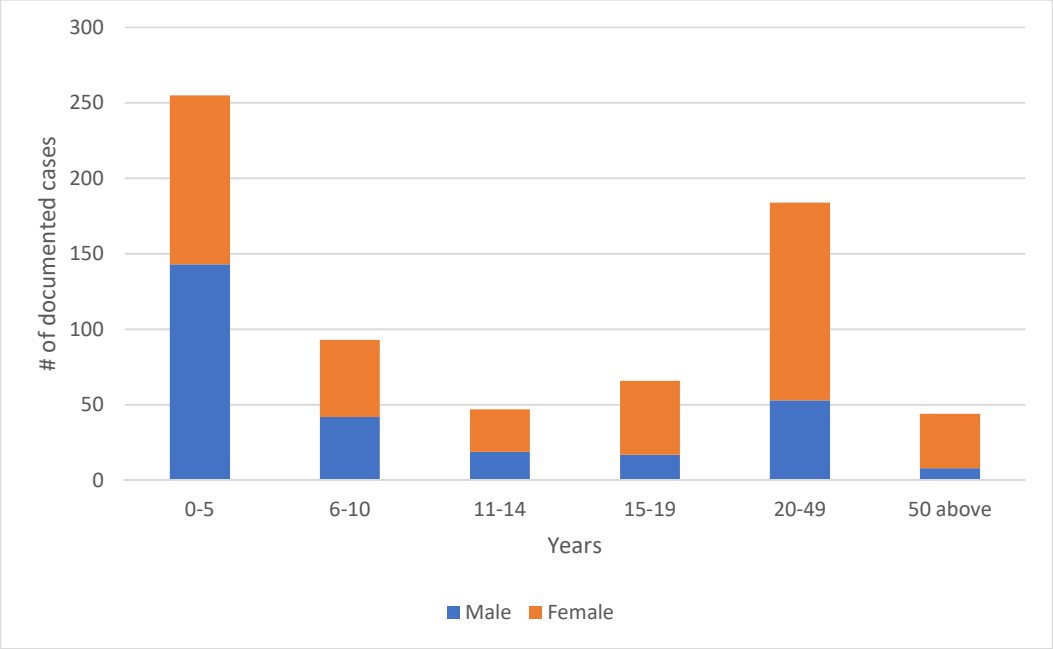
Table 8.13: Top five environmental diseases disaggregated by sex, August 2016-July 2017

Rank	Environmental disease	Female	Male	Total cases
1	Malaria	59% (407 cases)	41% (282 cases)	689
2	Acute respiratory infections	41% (155 cases)	59% (227 cases)	382
3	Malnutrition	52% (172 cases)	48% (160 cases)	332
4	Injuries	28% (61 cases)	73% (161 cases)	222
5	Diarrhoeal disease	54% (81 cases)	46% (69 cases)	150
	Total cases by sex	876	899	1,775

Source: Inpatient registers from the female, male and paediatric wards at Karonga District Hospital (2017) under the Ministry of Health, compiled and analysed by author

The distribution of the top five environmental health outcomes differed by age. Figure 8.18 indicates that inpatients five years and under accounted for the largest share of malaria at 37%, followed by inpatients between the ages of 20-49 years at 27%.

Figure 8.18: Malaria cases disaggregated by age and sex, August 2016-July 2017



Source: Inpatient registers from the female, male and paediatric wards at Karonga District Hospital (2017) under the Ministry of Health, compiled and analysed by author

Table 8.14 indicates that the distribution of malaria by age group was biased toward females, except for those five years and under. Females accounted for the largest share of cases in all other age groups.

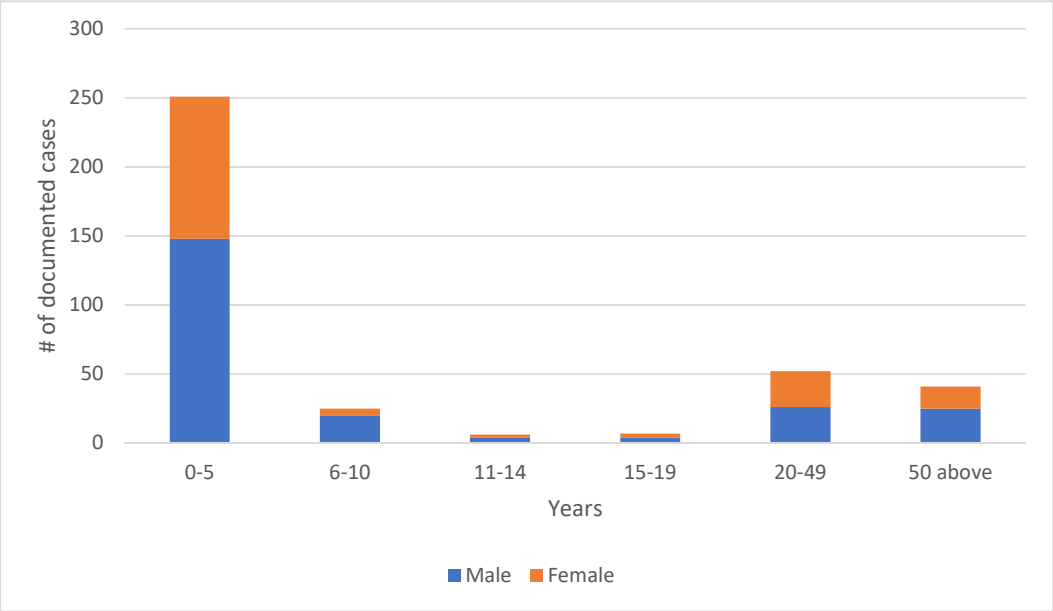
Table 8.14: Distribution of malaria cases by age and sex, August 2016-July 2017

	0-5 years	6-10 years	11-14 years	15-19 years	20-49 years	50 years and above
Male	56% (143)	45% (42)	40% (19)	26% (17)	29% (53)	18% (8)
Female	44% (112)	55% (51)	60% (28)	74% (49)	71% (131)	82% (36)
Total cases	255	93	46	66	184	44

Source: Inpatient registers from the female, male and paediatric wards at Karonga District Hospital (2017) under the Ministry of Health, compiled and analysed by author

Figure 8.19 indicates that inpatients five years and under accounted for the largest share of acute respiratory infections at 66%, followed by inpatients between the age of 20-49 years at 14%.

Figure 8.19: Cases of acute respiratory infection disaggregated by age and sex, August 2016-July 2017



Source: Inpatient registers from the female, male and paediatric wards at Karonga District Hospital (2017) under the Ministry of Health, compiled and analysed by author

Table 8.15 indicates that the distribution of acute respiratory infections by age group was biased toward males, except between the ages of 20 and 49 years.

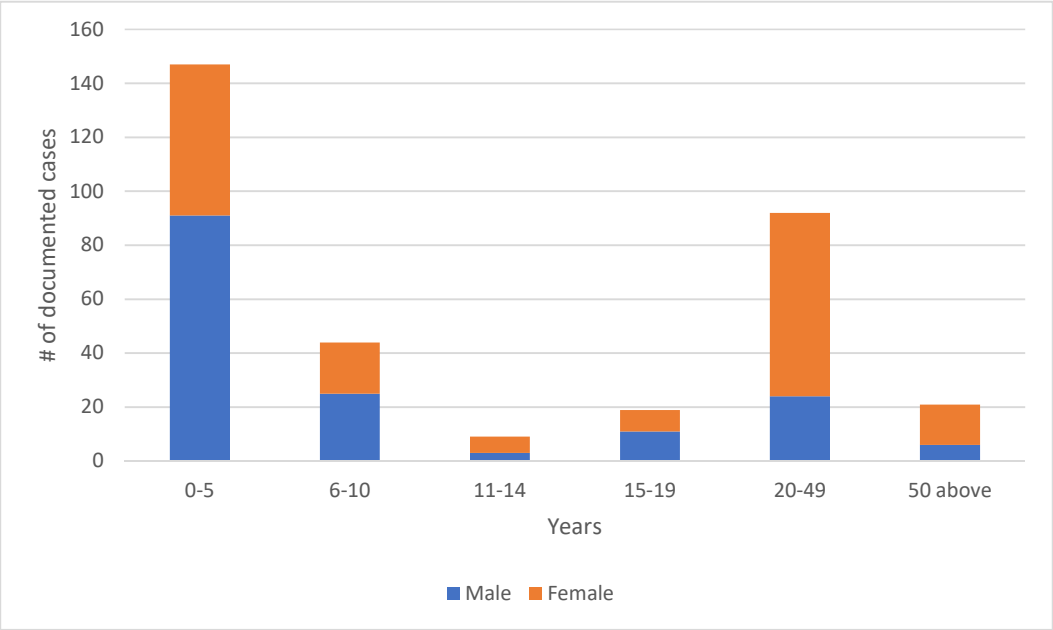
Table 8.15: Distribution of cases of acute respiratory infection by age and sex, August 2016-July 2017

	0-5 years	6-10 years	11-14 years	15-19 years	20-49 years	50 years and above
Male	59% (148)	80% (20)	67% (4)	57% (4)	50% (26)	61% (25)
Female	41% (103)	20% (5)	33% (2)	43% (3)	50% (26)	39% (16)
Total cases	251	25	6	7	52	41

Source: Inpatient registers from the female, male and paediatric wards at Karonga District Hospital (2017) under the Ministry of Health, compiled and analysed by author

Figure 8.20 indicates that inpatients five years and under accounted for the largest share of malnutrition at 44%, followed by inpatients between the age of 20-49 years at 28%.

Figure 8.20: Cases of malnutrition disaggregated by age and sex, August 2016-July 2017



Source: Inpatient registers from the female, male and paediatric wards at Karonga District Hospital (2017) under the Ministry of Health, compiled and analysed by author

Table 8.16 indicates that the distribution of malnutrition cases by age group varied with males experiencing the greatest share in the 5 and under, 6-10 years and 15-19 brackets. The distribution for females was greater in those 11-14 years old, reaching 74% and 71%, respectively, for those 20-49 and 50 years and older.

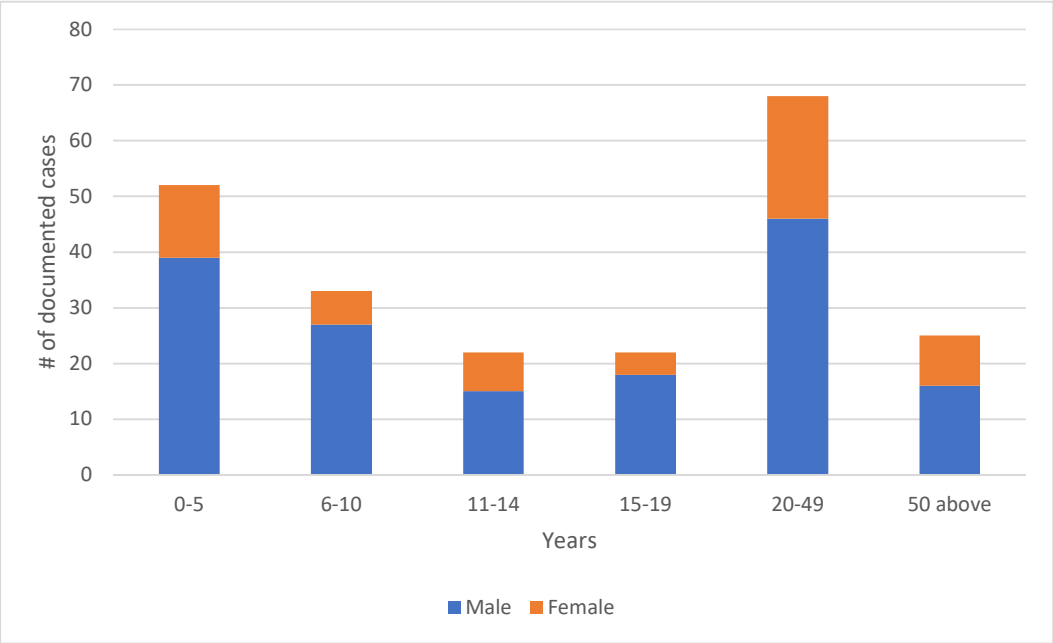
Table 8.16: Distribution of cases of malnutrition by age and sex, August 2016-July 2017

	0-5 years	6-10 years	11-14 years	15-19 years	20-49 years	50 years and above
Male	62% (91)	57% (25)	33% (3)	58% (11)	26% (24)	29% (6)
Female	38% (56)	43% (19)	67% (6)	42% (8)	74% (68)	71% (15)
Total cases	147	44	9	19	92	21

Source: Inpatient registers from the female, male and paediatric wards at Karonga District Hospital (2017) under the Ministry of Health, compiled and analysed by author

Figure 8.21 indicates that inpatients between the ages 20-49 years accounted for the largest share of injuries at 31%, followed by inpatients five years and under at 23%.

Figure 8.21: Injuries disaggregated by age and sex, August 2016-July 2017



Source: Inpatient registers from the female, male and paediatric wards at Karonga District Hospital (2017) under the Ministry of Health, compiled and analysed by author

Table 8.17 indicates that the distribution of injuries by age group was biased toward males at 73%. Males dominated injuries in each age group, especially among inpatients between the ages of 6-10 years and 15-19 years.

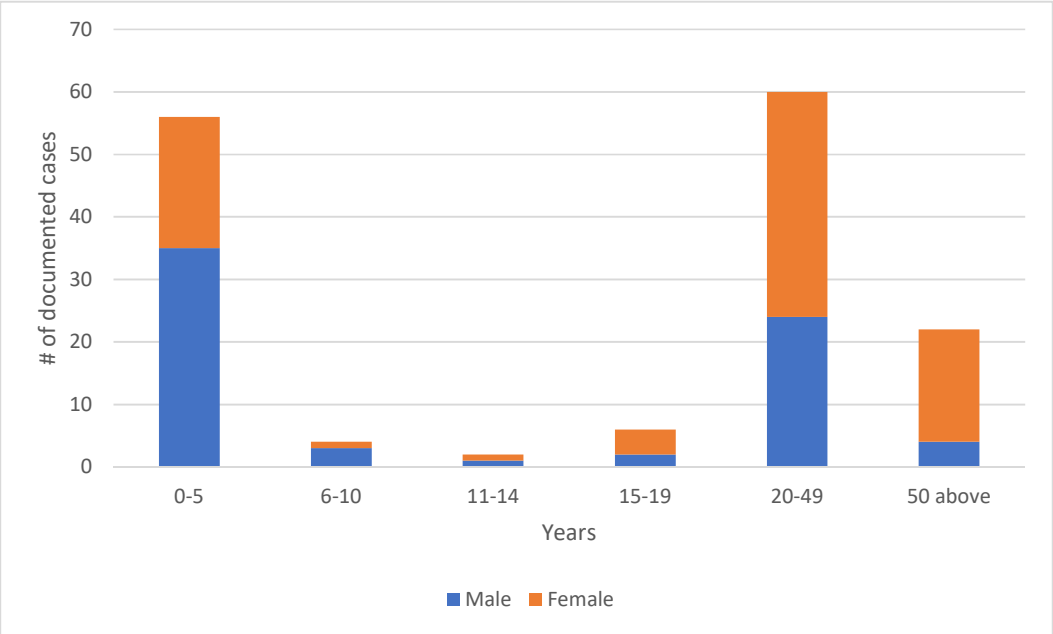
Table 8.17: Distribution of injuries by age and sex, August 2016-July 2017

	0-5 years	6-10 years	11-14 years	15-19 years	20-49 years	50 years and above
Male	75% (39)	82% (27)	68% (15)	82% (18)	68% (46)	64% (16)
Female	25% (13)	18% (6)	32% (7)	18% (4)	32% (22)	36% (9)
Total cases	52	33	22	22	68	25

Source: Inpatient registers from the female, male and paediatric wards at Karonga District Hospital (2017) under the Ministry of Health, compiled and analysed by author

Figure 8.22 indicates that inpatients between the ages 20-49 years accounted for the largest share of diarrhoeal disease at 40%, followed by inpatients five years and under at 37%.

Figure 8.22: Cases of diarrhoeal disease disaggregated by age and sex, August 2016-July 2017



Source: Inpatient registers from the female, male and paediatric wards at Karonga District Hospital (2017) under the Ministry of Health, compiled and analysed by author

Table 8.18 indicates that the distribution of diarrhoeal disease by age group varied widely. Most cases were concentrated among females aged 50 years and over, between the ages of 15-19 years and 20-49 years. Males dominated diarrhoeal disease 5 years and under and between the ages of 6-10 years.

Table 8.18: Distribution of diarrhoeal disease by age and sex, August 2016-July 2017

	0-5 years	6-10 years	11-14 years	15-19 years	20-49 years	50 years and above
Male	63% (35)	75% (3)	50% (1)	33% (2)	40% (24)	18% (4)
Female	38% (21)	25% (1)	50% (1)	67% (4)	60% (36)	82% (18)
Total cases	56	4	2	6	60	22

Source: Inpatient registers from the female, male and paediatric wards at Karonga District Hospital (2017) under the Ministry of Health, compiled and analysed by author

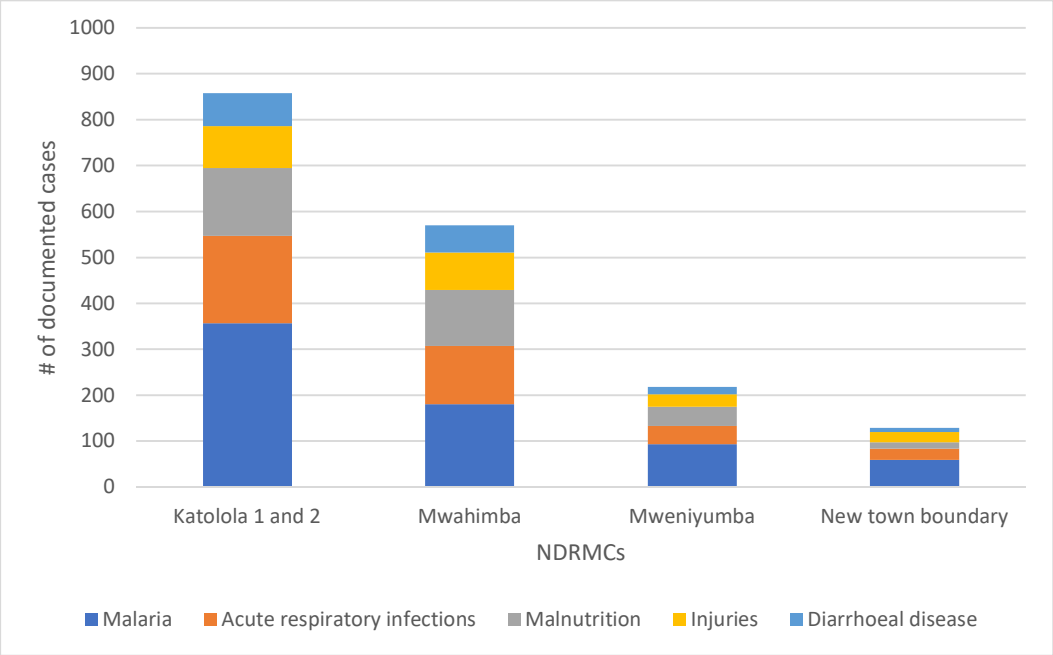
8.2.7 The impact of location on environmental health

In order to conduct a spatial analyse of hospital records at the neighbourhood scale, a list of all villages in the old and new town boundary was compiled (Annex I). A map created by the ReMapRisk project under Urban ARK was then used to determine the location of all known villages in the old town boundary. However, the project did not include villages in the new town

boundary. Consequently, those villages were aggregated into one category for the new town boundary. All other villages were aggregated into the town's four Neighbourhood Disaster Risk Management Committees (NDRMCs): Mwahimba, Mweniyumba, and Katolola 1 and 2. However, due to recording keeping errors concerning the name of villages in Katolola 1 and 2, it was not possible to disaggregate their NDRMCs. They were therefore combined.

At the neighbourhood level, Figure 8.23 indicates that the top five environmental diseases in each NDRMC were led by malaria followed by acute respiratory infections. The exceptions were Mweniyumba, which had a larger share of malnutrition at 19% than acute respiratory infections at 18%, and the new town boundary, which had a larger share of injuries at 17% than malnutrition at 11%. Overall, the differences between the top five environmental diseases between the NDRMCs were minimal (Table 8.19).

Figure 8.23: Top 5 environmental diseases for each NDRMC, August 2016-July 2017



Source: Inpatient registers from the female, male and paediatric wards at Karonga District Hospital (2017) under the Ministry of Health, compiled and analysed by author

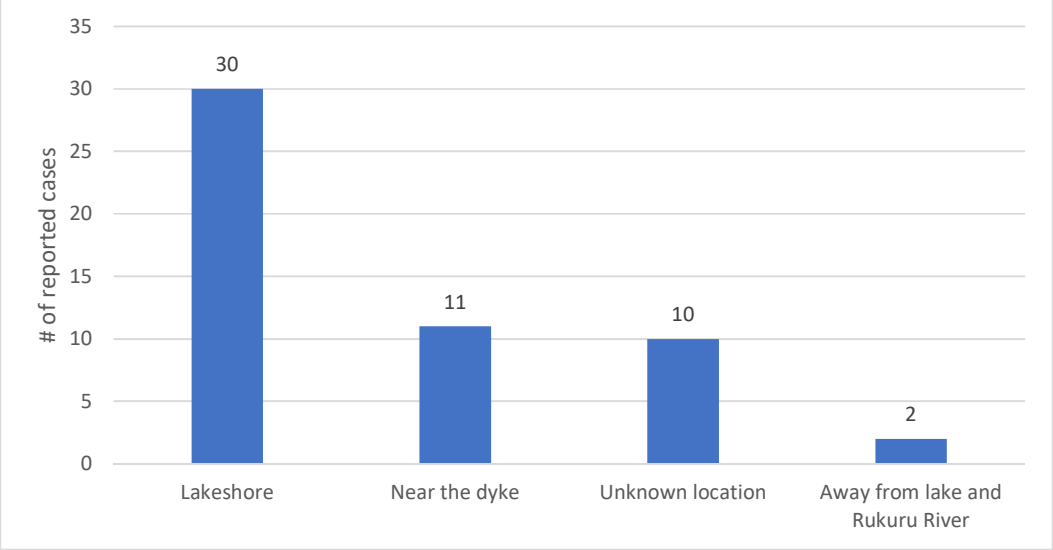
Table 8.19: Top five environmental diseases for each NDRMC, August 2016-July 2017

	Malaria	Acute respiratory infections	Malnutrition	Injuries	Diarrhoeal disease
Katolola 1 and 2	42% (357)	22% (190)	17% (148)	11% (91)	8% (72)
Mwahimba	32% (180)	22% (127)	21% (122)	14% (82)	10% (59)
Mweniyumba	43% (93)	18% (40)	19% (42)	12% (27)	7% (16)
New Town boundary	46% (59)	19% (25)	11% (14)	17% (22)	7% (9)

Source: Inpatient registers from the female, male and paediatric wards at Karonga District Hospital (2017) under the Ministry of Health, compiled and analysed by author

The hospital records for the cholera outbreak between January and July 2016 were disaggregated at the village level to analyse the spatial distribution of cases in the town. Figure 8.24 indicates that the outbreak was concentrated in fishing villages along the lakeshore area adjacent to Lake Malawi, followed by the dyke, which were among the hardest hit by the floods during the rainy season (field notes, 2017). Few cases were reported away from these locations. Villages with unknown locations included those in the new town boundary, which have yet to be mapped.

Figure 8.24: Location of reported cholera cases in Karonga Town, January-July 2016

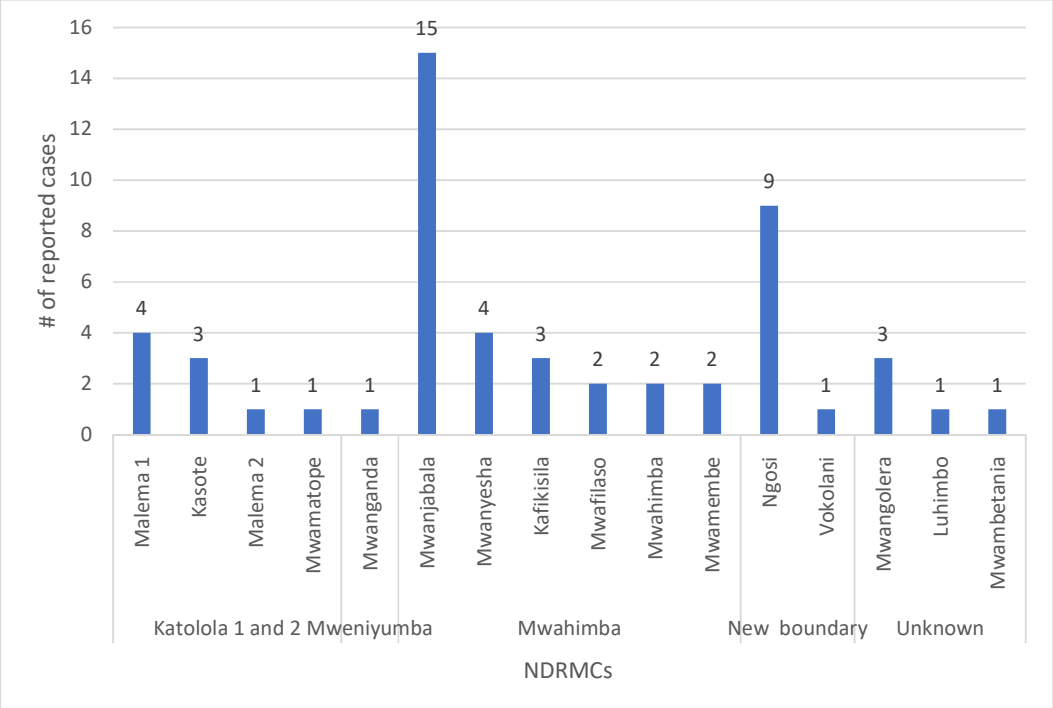


Source: Inpatient registers from the female, male and paediatric wards at Karonga District Hospital (2017) under the Ministry of Health, compiled and analysed by author

At the neighbourhood level, Figure 8.25 indicates that the majority of cases were reported in Mwahimba, where most fishing villages along the lakeshore are located. Mwanjabala was the hardest hit, accounting for 28% of all cases. Administratively, 83% of all cases were concentrated

in the old town boundary, while the remaining 17% were concentrated in the new town boundary.

Figure 8.25: Reported cases of cholera between villages in Karonga Town, January-July 2016



Source: Inpatient registers from the female, male and paediatric wards at Karonga District Hospital (2017) under the Ministry of Health, compiled and analysed by author

8.3 Limitations

The analysis of the hospital records entailed three main limitations. First, the use of inpatient records may over-represent more serious illnesses and injuries that require hospitalisation and under-represent people who do not typically go to hospital when sick or injured for socio-economic reasons (lack of disposable income), cultural reasons (belief in traditional healers) or mobility reasons (the elderly and those living in peripheral settlements may find the hospital to be too distant). The hospital records may not be entirely representative of the town's population as a result. To address this limitation, the sample included all inpatients from the town who were admitted to Karonga District Hospital over a 12-month period, amounting to nearly 3,000 records.

Second, the use of hardcopy registers to record information for inpatients resulted in numerous sample errors involving missing information (unspecified village was among the most common), errors (misspelling of villages was among the most common) and illegibility (varied). In total,

1,494 records contained errors and were therefore excluded, accounting for nearly half of all valid records. The same errors reduced the representativeness of the sample as a result.

Lastly, HIV/AIDS as an underlying health conditions was not specified in many health records, even though Malawi ranks among the sub-Saharan African countries with the highest HIV/AIDs prevalence; around 1 million people were estimated to be living with HIV in 2016 (UNAIDS, 2018). HIV/AIDs increases the susceptibility of infected people to infectious diseases (notably TB and pneumonia), meaning their causes may be attributed more to immune deficiency rather than environmental factors. While many people nevertheless die from HIV/AIDs as a result of environmental causes due to their heightened susceptibility (Prüss-Üstün and Corvalán 2006), it was not possible to determine the number of people who did for the reasons above.

8.4 Discussion

Several key findings stand out from the analysis above. First and foremost, that environmental health problems accounted for 63% of all reported cases was surprising given the narrow way in which the environment was defined here in largely physical terms. For instance, most of the diseases and health conditions identified in the environmental health matrix in Chapter Four (section 4.6.3) are known to be strongly linked to poor quality living and working environments (Prüss-Üstün and Corvalán 2006), as discussed in Chapter Two (section 2.1.4). Moreover, that most environmental health problems were dominated by infectious and parasitic diseases (chiefly malaria) substantiates the longstanding suspicion that environmental conditions in smaller urban centres may be highly permissive of disease vectors (such as blood sucking insects, intestinal worms, ticks, freshwater aquatic snails), although this hypothesis requires further case study research to validate.

It was similarly surprising that malaria, acute respiratory infections, malnutrition, injuries and diarrhoeal disease accounted for 93% of all environmental health problems. This finding suggests that certain environmental determinants—poor water and sanitation, seasonal flooding and waterlogging, air pollution, density and overcrowding, occupational hazards, disasters—may be of heightened importance in situations where the urban environment is poorly planned and managed. The consequences for groups traditionally identified as 'vulnerable', as discussed in Chapter Two (section 2.1.4), was substantiated by the observation that children five years and under accounted for the largest share of environmental health problems, namely acute respiratory infections at 66%, malaria at 59% and malnutrition at 44%.

The finding that most environmental health problems (principally diarrhoeal disease) were concentrated in the rainy season indicates a strong relationship between flooding and waterlogging, poor service provision (notably water and sanitation, drainage, solid waste management) and inadequate land management (the construction of settlements in flood-prone areas). The concentration of cholera outbreaks during the rainy season in villages along the lakeshore area, where access to water and sanitation is among the worst in the town, is particularly telling of this relationship, as other studies have also pointed out (see Manda et al. forthcoming).

8.5 Conclusion

This Chapter marks the first known time hospital records have been used to assess the prevalence and socio-spatial distribution of environmental health outcomes in an urban population in Malawi. The findings indicating that health problems are strongly related to the environment highlights the need for a better understanding of underlying causes external to individuals, which hospital records do not specify. Accordingly, the following Chapter presents an in-depth analysis of the multiplicity of determinants of environmental health in Karonga Town. Together, these Chapters aim to describe environmental health outcomes and to explain their underlying causes.

Chapter 9 The determinants of environmental health in Karonga Town

The previous Chapter documented cases of environmental health outcomes in Karonga Town's inpatient population to analyse the extent to which health is linked to environmental causes. Building on that analysis, this Chapter seeks to determine these causes through an investigation of the multiple determinants of environmental health and their complex interactions.

As a starting point, Table 9.1 identifies the possible determinants of the five top environmental health problems that were identified in Chapter Eight (section 8.2.2). Such problems may be among the most serious since they accounted for 93% of all recorded cases of environmental morbidities in the urban inpatient population during the study period (July 2016- August 2017). Assessing their determinants provides an entry point for better understanding the interventions required to plan a healthier town environment.

Table 9.1: Possible determinants of the top five environmental health problems in the urban inpatient population, August 2016- July 2017

Top five environmental health problems*	Possible determinants in the environment
Malaria	Flooding and waterlogging Standing pools of water Lack of drains Blocked drains Ineffective dyke and drainage channels Deficient housing conditions (open eves)
Acute respiratory infections	Lack of electricity connections to the home Lack of ventilation in the home and workplace Occupational hazards linked to inhalation of particulates (rice husks and dust) Location of rice mills in and around residential areas
Malnutrition	Food insecurity Drought Poor sanitation
Injuries	Occupational hazards Use of open flame cooking sources Environmental hazards in and around the home (unsafe footpaths) Disaster hazards (earthquakes, floods, strong winds) Road traffic accidents
Diarrhoeal disease	Flooding and waterlogging Poor sanitation Unsafe drinking water

* Identified from the analysis of hospital records from the Karonga District Hospital (2017)

Ethnographic research was used to cross-validate the hospital records and incorporate different perspectives on environmental health and its determinants at multiple scales. This included: Follow Along Participation (FAPO) with Health Surveillance Assistants (HSAs); informal observations and pictorial documentation of environmental hazards around the home, neighbourhood and town; informal discussions and semi-structured interviews with local residents, policymakers and practitioners; and secondary analysis of available data on urban growth dynamics and access to basic infrastructure and services. The analysis involved two stages. In the first stage, the various determinants of environmental health were examined individually. In the second stage, the determinants were analysed using complexity thinking to understand how they interrelate, overlap and mutually reinforce one another. The analysis thus assumes that the determinants of environmental health do not exist in isolation, and that changes to them will influence population health (Glouberman et al. 2006: Rydin et al. 2012). The analysis addressed the fourth research objective:

- To understand the multiplicity of interacting determinants of environmental health in Karonga Town.

This Chapter is comprised of five sections. Section one analyses the determinants of environmental health in Karonga Town in the context of urban growth and change, while section two analyses how these determinants interact at multiple nested scales. Section three discusses the implications of the findings for planning a healthier town environment, and section four discussed the limitations of the analysis. The final section concludes. The main findings are synthesised in Chapter Eleven (section **Error! Reference source not found.**).

9.1 Key determinants of environmental health in Karonga Town

The determinants of environmental health identified in Table 9.1 were primarily related to the environment and needed to be expanded to incorporate other determinants linked to urban processes, institutional systems and social relations that influence the quality of the environment and related health outcomes. The determinants presented in Table 9.2 thus expand those presented in Table 7.1 to incorporate demographic, socio-economic and institutional determinants of health beyond the environment.

Table 9.2: Determinants of environmental health under investigation in Karonga Town

Determinants of environmental health	Description
Poorly planned and managed urban growth and development	Decision to locate the town in an area exposed to numerous environmental hazards, investments that have contributed to its growth, and development projects that violate the regulatory framework
Structural transformation	Transformations in the urban economy linked to occupational hazards, low productivity and income and pre-existing agricultural activities (including animal rearing, fishing and irrigation farming)
Physical hazards	Exposure to physical hazards (including floods, earthquakes, drought, high temperatures, strong winds, road traffic accidents and chemical pollutants)
Housing and living conditions	Exposure to unsafe and unsanitary conditions (including poor housing and inadequate provision of basic infrastructure and services)
Poverty and gender	The unequal distribution of environmental health problems based on social identity and status
Development projects	Recent developments that threaten environmental health by reinforcing environmental risk accumulation cycles
Institutional constraints	The inability to plan and manage urban growth, provide basic infrastructure and services and adapt to emerging environmental hazards
Conflicts between society and governance	Impacts on the ability to form partnerships between stakeholders involved in decision-making processes and planning procedures

9.1.1 Poorly planned and managed urban growth and development

Karonga Town's declaration as a Statutory Planning Area in 1991 did not occur until the population had exceeded 19,000, as discussed in Chapter Five (section 5.2.1). Until then, its growth was almost entirely unplanned, with the exception of a small number of ad hoc layout plans to guide small-scale commercial development (Ministry of Lands and Housing 2013). A Town Planning Committee was established in the same year to approve, regulate and monitor building works by developers. In 2003, the Committee prepared the first Urban Structure Plan to comprehensively guide urban development, but it was replaced in 2013 by the current plan in response to the 2009 flood disaster and the 2011 earthquake disaster. However, in the absence of a functional and elected Town Council, which was dissolved by national government in 2005, as discussed in Chapter Give (section 5.2.5), the ability to implement the regulatory framework has been severely constrained, leading to widespread planning failure (field notes, 2017).

The following sections explore how rapid unplanned urban growth and expansion, in combination with other processes of in situ urban change, have resulted in the accumulation of

urban risks across the full spectrum of hazards, presenting a major threat to Karonga Town's growth and development potential as an emerging secondary centre in the Northern Region.

9.1.2 Structural transformation

Recent social and economic transformations in trade, transport, hospitality and tourism have been driven by Karonga Town's position as an important trading centre near the Tanzanian border, as discussed in Chapter Five (section 5.1.3). However, several aspects of the urban economy raise concerns for environmental health:

Informal economic activities

Around 60% of the town's working-age population is employed in the informal sector (Ministry of Lands and Housing 2013). Because informal economic activities tend to be unregulated, informal workers may be exposed to various occupational hazards, ranging from chemical agents to inadequate lighting, ventilation, space and protection from machinery and noise. The growth of informal bicycle taxis has exposed operators and passengers to risk of road traffic accidents. Accidents such as these may be concentrated among lower-income groups since they tend to rely on bicycle taxis for employment and transport. Informal vendors have also emerged outside the market next to open drains, standing pools of water, a solid waste collection point, and an abattoir. These exposures pose a threat not only to their health, but also that of their customers through leaching (Figure 9.1).

Figure 9.1: Space where informal vendors operate outside the market

Photo credit: Author (2017)

Low productivity

The town's economy is dominated by small-scale enterprises (informal and formal) involving: vending; carpentry; basket making; tinsmithing; blacksmithing; pottery, transport, shoe, radio, watch, bicycle and vehicle repairs; tailoring; fishing; urban agriculture; milling (maize, rice and to a lesser extent timber); and home-based enterprises (typically run by women) (Figure 9.2) (Ministry of Lands and Housing 2013). Widespread deficits in electricity, water and sanitation could impact environmental health if they contribute to occupational hazards, limit the time available for care work or increase the cost of production, thereby limiting the income available to owners and operators who may already find it difficult to afford food and non-food essentials (such as nutritious food, safe water, transport and adequate housing).

Figure 9.2: Home-based enterprise, Mwanyesha

Photo credit: Author (2017)

Despite recent transformations in the town's economy, agriculture remains an important source of income and livelihoods, particularly for the poor. Several agricultural activities raise concerns for environmental health.

Cattle rearing

The prevalence of cattle rearing in the town (Figure 9.3) contributes to zoonotic diseases, including African swine fever, Newcastle virus and liver fluke, which are common in Karonga District (Karonga District Council 2013). In addition, the herding of cattle along major roads

contributes to risk of road traffic accidents by forcing cyclists and pedestrians into oncoming traffic, as I experienced on numerous occasions (Figure 9.4 was taken while riding my bicycle into town).

Figure 9.3: Cattle grazing in the town centre

Photo Credit: Author (2017)

Figure 9.4: Cattle grazing along roadsides in Karonga Town

Photo Credit: Author (2017)

Fishing

Fishing remains a major source of livelihood for many households, particularly in the lakeshore area. A recent study (Manda et al. forthcoming)found a link between fishing livelihoods and a cholera outbreak in December-April 2016. Because fishermen follow fish stocks up and down the lake at night, they sleep in fishing camps during the day. Many camps lack provision of sanitation, forcing fishermen to defecate in the lake. Because traditional/non-statutory settlements along the lakeshore lack piped water (including communal water points), many households are forced to rely on unsafe sources, including the lake and nearby rivers. These factors rendered fishing villages in the lakeshore area especially vulnerable to the cholera outbreak. Hospital records show that 53 cases of cholera were reported in the town (new administrative boundary) and that the majority were concentrated in the lakeshore area (Table 9.3).

Table 9.3: Cholera cases by village in Karonga Town, January-July 2016

Village Development Committee (VDC)	Village	Number of cases
Katolola	Malema 1	4
	Kasote	3
	Malema 2	1
	Mwamatope	1
Mweniyumba	Mwanganda	1
Mwahimba	Mwanjabala	15
	Mwanyesha	4
	Kafikisila	3
	Mwafilaso	2
	Mwahimba	2
	Mwawembe	2
New town boundary	Ngosi	9
	Vokolani	1
Unknown	Mwangolera	3
	Luhimbo	1
	Mwambetania	1
Total		53

Source: Karonga District Hospital under the Ministry of Health, compiled and analysed by author

Irrigation farming

The prevalence of fertile alluvial soils, particularly in the lakeshore area and along river banks, makes the town ideal for agriculture and agro-based industry (Ministry of Lands and Housing 2013). Irrigation farming is also common due to the proximity of the lake and rivers (field notes, 2017). On the other hand, farming can promote disease vectors (malaria, schistosomiasis and

filariasis) by diverting surface water for irrigation. Vector exposure may be heightened for low-income households who typically cultivate most available space on their plot with maize and other crops to enhance food security (Figure 9.5).

Figure 9.5: The common practice of cultivating available space on the plot

Photo credit: Author (2017)

9.1.3 Environmental hazards

Karonga Town is exposed to numerous physical hazards:

Floods

The town is highly exposed to seasonal and episodic floods (including flash floods and out-bank river floods) due to its location in a low-lying flood plain on the shores of Lake Malawi and along the banks of the North Rukuru River (Figure 9.6). The town is also exposed to periodic lake rise; the lake rose from 471 metres above sea level in 1979 to 478 metres in 1980, resulting in the flood disaster that led to the town's relocation (Manda et al., 2016). While a dyke was constructed in the 1980s to prevent future flood events, it has not been properly maintained. Parts of the dyke were also destroyed by the 2009 earthquake, which contributed to the flood disaster in 2011 (Figure 9.7) (ibid).

Figure 9.6: Flood waters consume the town centre during the rainy season, 17 April 2017

Photo credit: Wisdom Bwanali (2017)

Figure 9.7: Damage to the dyke by 2009 earthquake contributed to the flood disaster in 2011

Photo credit: Manda (2011)

Poor planning and drainage infrastructure has exacerbated the town's vulnerability, demonstrated by the frequency of small-scale flooding and waterlogging that affect the town on a seasonal basis. Figure 9.8 was taken on the veranda of a home in Mwafilaso Village that was affected by a flood triggered by heavy rains during the night of 1 April 2017. Residents indicated that many were forced to remain in their homes the following day to avoid "dirty water" contaminated with human and solid waste (note the pit latrine in the background) (field notes, 2017). Many villages lack drainage systems, resulting in waterlogging, which damages and destroys pit latrines, reinforcing a vicious cycle of cross contamination.

Figure 9.8: Seasonal flood waters in Mwafilaso

Photo credit: Berlin Mwamatembe (2017)

Due to mounting land pressures, some villages have expanded into areas on the opposite side of the dyke (Figure 9.9). The frustration of coping with frequent floods during the rainy season motivated residents of one village to dig up a section of the dyke so that households on the protected side would experience their situation. The dyke was subsequently repaired by the affected community (field notes, 2017).

Figure 9.9: Housing built on opposite side of dyke, Mwambotope

Photo credit: Author (2017)

Figure 9.10 was taken in the market following a seasonal flood triggered by heavy rains during the night of 16 April 2017. Despite the flood waters, many vendors and shopkeepers (mostly women) opened their businesses the following morning. While some wore rain boots to protect their skin, others did not, exposing them to potential pathogens. The market and its surrounds have become increasingly flood-prone due to the failure of the District Council to maintain drains (Figure 9.11).

Figure 9.10: Flood waters in the market, 17 April 2017

Photo credit: Wisdom Bwanali (2017)

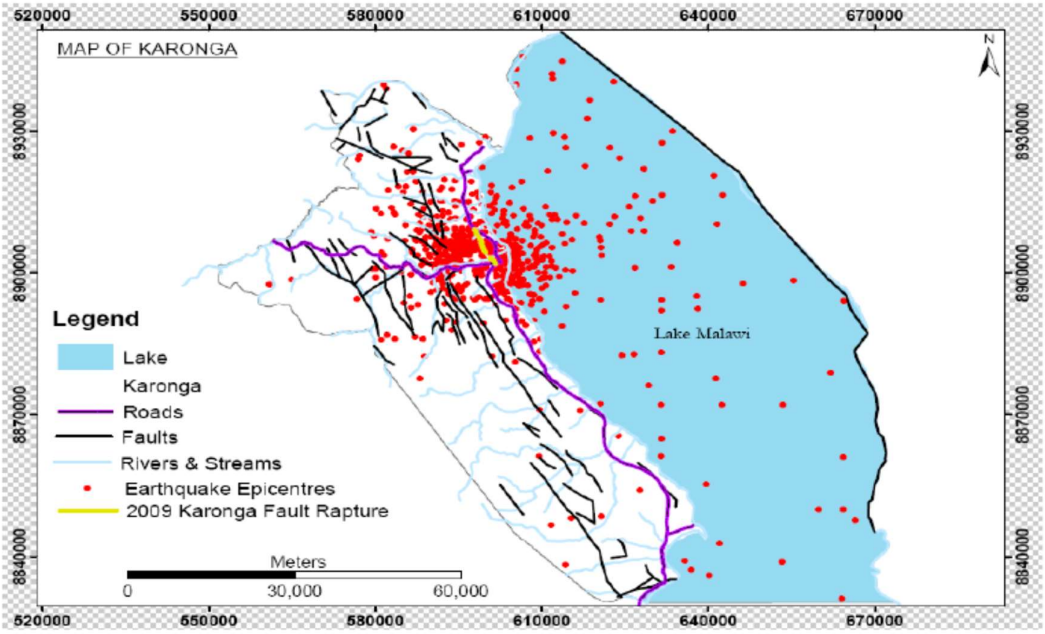
Figure 9.11: Drains inundated by flood waters around the market, 17 April 2017

Photo credit: Wisdom Bwanali (2017)

Earthquakes

Earthquakes and tremors pose major risks in Karonga Town, among other parts of the Northern Region due to its location in the Great Rift Valley and proximity to fault lines and epicentres (Figure 9.12). The earthquakes in 2009 had magnitudes ranging from 5.4 to 6.0, causing four deaths and 300 injuries (Manda et al. 2016). Over 1,000 houses collapsed and another 3,000 were damaged (ibid). The discussion of housing conditions below addresses vulnerability linked to poor quality of building materials, improper construction practices, and lack of conformity to building codes.

Figure 9.12: Earthquake epicentres and fault lines in and around Karonga Town



Source: Ministry of Lands and Housing (2013)

Droughts

Droughts pose a major threat to urban food security during the dry season (December-February). Approximately 75% of households in the town are engaged in crop farming (mainly maize) and livestock rearing (Manda et al. 2013). Many of these households were hard hit by the recent armyworm invasion in February and March 2017, which destroyed maize crops throughout the country. Low-income households experienced significant hardship as a result (Box 7.1). Weevils and aphids also affect crops on a regular basis, posing another risk to food security (Karonga District Council 2013).

Box 9.1: A poor household coping with a dry spell in Karonga Town, March 2017

Watson, his wife and two children live in Bwiba village, Karonga Town's wealthiest residential area. But they do not enjoy the amenities. Instead, they live in a small one room house of no more than 10 m^2 constructed of semi-permanent materials. While they have access to a communal standpipe, they rely on a traditional pit latrine, which they share with nearby households.

The hardships faced by Watson and his family were heightened during the dry season. As a caretaker of a property whose owner lives in Lilongwe, Watson is paid only 10,000 Malawi Kwacha per month, equivalent to USD 46 cents per day. The monthly cost of maize flour for his family amounts to 13,500 Malawi Kwacha alone. So Watson, like many other low-income households in the town, cultivates most of the available space around his home with maize.

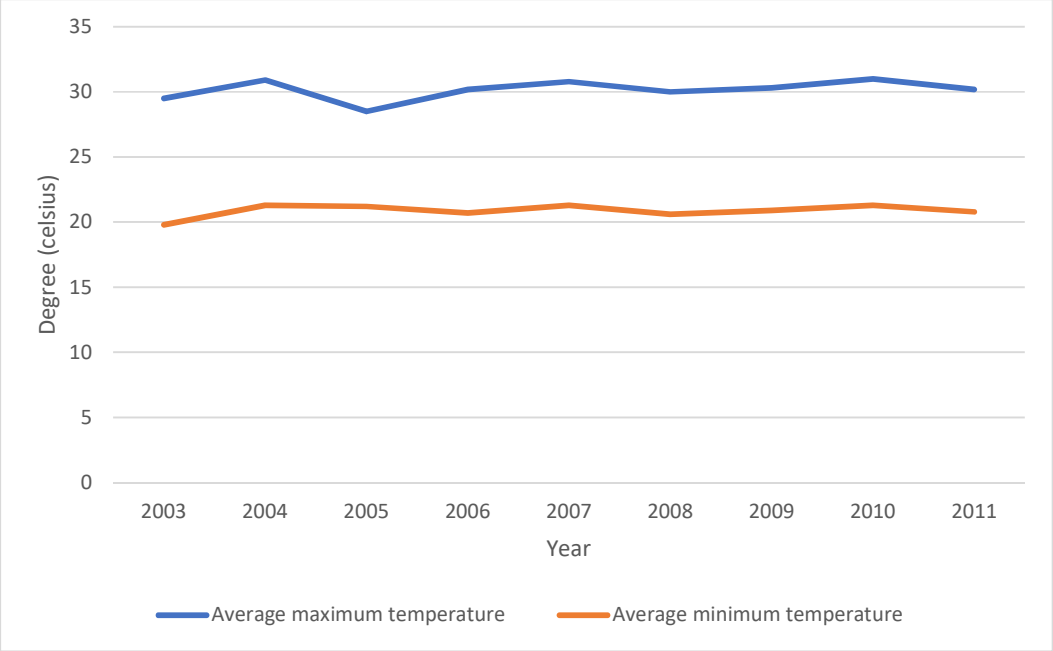
The invasion of the armyworms, combined with unseasonably dry conditions, ruined most of his crop, forcing Watson to find piece work to afford maize, and leaving his wife to fulfil his caretaking duties. While they were away working, their one-year old daughter was left unattended with some older children near the home and was stung by a scorpion. Two weeks later, she fell into a pit of water when left unattended and needed to be rushed to hospital after choking. Luckily, she recovered fully, but the hardships remain for Watson as he struggles to provide for his family in the town's harsh environment.

Source: Field notes (2017)

High temperatures

Karonga Town is one of the hottest places in Malawi, with an average annual maximum temperature of about 30 degrees Celsius and an average minimum temperature of around 20 degrees (Figure 9.13) (Ministry of Lands and Housing 2013). Climate change is expected to lead to gradual increases in temperature and more frequent and intense heat waves (Vincent et al. 2014). Climate-related heat stress is likely to worsen respiratory diseases, especially for people who live in poorly ventilated buildings, have pre-existing health conditions (particularly chronic lung diseases) and are exposed to air pollution (particularly indoor) (Smith et al. 2007).

Figure 9.13: Average maximum and minimum temperatures (Celsius) in Karonga Town, 2003-2011



Source: Ministry of Lands and Housing (2013)

Strong winds and tidal currents

Strong winds from the south-east affect the town periodically, causing damage to housing and injuries. For example, the roof of an elderly widow's home in Mwamatope was blown off by a recent storm (Figure 9.14). Strong tial currents on the lake have also damaged the water intake pipes for the Karonga Water Plant (Figure 9.15). The decision to locate the plant on the lakefront has come under heavy fire from physical planners for exposing the facility to tidal currents, posing a potential threat to the town's water supply network and hence public health, discussed below.

Figure 9.14: An elderly widow in front of her house missing a roof due to strong winds, Mwamatope

Photo credit: Author (2017)

Figure 9.15: Proximity of the Karonga Water Plant (pictured left) to Lake Malawi (pictured centre-right)

Photo credit: Author (2016)

Road traffic accidents

Pedestrians and bicycles are the dominant mode of transport in the town, as in other smaller urban centres (such as Salima). However, roads are designed primarily for automobiles. Consequently, bicycles and pedestrians are often forced to use narrow and poorly maintained road shoulders prone to waterlogging in the absence of proper drainage (Figure 9.16). At the same time, major roads, including the M1 and M5, are equipped with poorly designed speed humps that motivate drivers to speed over them due to the loud and irritating vibrations they cause at lower speeds (Figure 9.17). With rising congestion, the risk of road traffic accidents is

likely to increase for pedestrians and cyclists along major roads and around the market, where the bus depot is located.

Figure 9.16: Roads are poorly maintained and often waterlogged during the rainy season

Photo credit: Author (2017)

Figure 9.17: Poorly designed speed humps promote speeding

Photo credit: Author (2017)

Chemical pollutants

The uranium mine opened by Paladin, an Australian mining company, at Kayelekera in 2009 has led to rising population health concerns (Manda et al. 2016). A recent study (Chareyon 2015) found that uranium fallouts of 0.22-42.5 µg/l were present in rivers (such as the Champanji, Champwasha and Sere) flowing into the North Rukuru River. Communities have become increasingly outraged at the risk of water contamination from mining activities combined with a perceived lack of government oversight (Wanda et al. 2017). While the mine was decommissioned due to declining market prices, operations are expected to resume once the market conditions improve.

9.1.4 Housing and living conditions

Karonga Town has benefitted from a recent town-wide survey on urban risk completed in 2016 (Manda and Wanda 2017). But the survey was not socially or spatially disaggregated, obscuring risk differentials between people and neighbourhoods. It was also based on the town's old boundary, excluding peripheral settlements. The findings nevertheless provide a general picture of living conditions and related health risks. All figures in this section come from Manda and Wanda (2016) unless otherwise stated.

Access to water

According to the survey (Manda and Wanda, 2016), 90% of households have access to piped water connections, including 18% with piped water in the home, 42% on the plot, 11% on a neighbour's plot and 20% to a communal water point. The remaining 7% of households accessed water from boreholes, while 2% accessed water from the river, lake or wells.

Shallow wells serve less than 2% of households in the town (Manda and Wanda, 2016). FAPO with the HSA in Mwanyesha indicated that shallow wells are typically used for purposes other than drinking, cooking and washing, such as brick making (Figure 9.18). While boreholes are more common than shallow wells, many are not functional (Figure 9.19). However, boreholes are not encouraged in urban areas due to risk of contamination to groundwater sources (Manda, 2009). Communal water points appear to be more common than other boreholes and wells, although villages along the lakeshore tend to be under-served. According to data obtained from the Northern Region Water Board (NRWB), there were 78 communal water points in the town as of January 2016 (data on the number of other water sources, and the share of households they serve, were not available at the village level).

Figure 9.18: Shallow well, Mwanyesha

Photo credit: Author (2017)

Figure 9.19: Dysfunctional borehole near the hospital

Photo credit: Author (2017)

Access to sanitation

The survey by Manda and Wanda (2016) indicated that 51% of households rely on traditional pit latrines, 28% rely on ventilated improved pit (VIP) latrines, 14% rely on flush toilets with septic tanks, 4% rely on neighbours' latrines, and 4% have no toilets. The survey also indicated that 27% of pit latrines were located less than 100 metres away from shallow wells, while several

graveyards were located near other unsafe water sources. The potential consequences for population health are serious—water quality samples taken from 27 unprotected sources revealed that 56% had levels of faecal coliforms (E-coli) exceeding World Health Organization (WHO) safety standards (Manda and Wanda 2017). This situation suggests that a much lower share of households have access to safe water due to risks of cross contamination.

FAPO with the HSAs revealed that most households fail to construct permanent pit latrines since they are regularly damaged or destroyed during the rainy season, as discussed above. Past efforts by non-governmental organisations (NGOs) to construct pit latrines in flood exposed villages have failed. For example, of the four traditional pit latrines constructed by the Red Cross in Mwamatope three years ago, one was functional, two were full, and one was destroyed by floods (Figure 9.20). According to the HSAs, most households prefer to repair and rebuild temporary pit latrines rather than constructing permanent facilities, since they are costlier to repair and rebuild. The town's high water table and unstable soils pose additional challenges for the construction of safer and more durable facilities.

Figure 9.20: Three-year old pit latrine destroyed by floods, Mwamatope

Photo credit: Author (2017)

Housing conditions

Housing conditions vary in the town. The survey by Manda and Wanda (2017) found that 50% of households live in semi-permanent housing (defined as any combination of permanent and traditional materials), 41% live in permanent housing (defined as having roofs constructed from iron sheets, tiles, concrete or asbestos and walls of burnt bricks, concrete or stones) and 9% live in temporary housing (defined as having thatched roofs and mud walls or walls made of mud and wattle)[13].

[13] Housing conditions are defined by NSO (2010).

Informal observations made while walking and cycling throughout the town indicate that most housing is semi-permanent (Figure 9.21-9.23). Very little temporary housing was observed. Informal observations also indicated that most semi-permanent housing has been constructed without adhering to formal building codes and standards, meaning their construction often deviates in some way (open eves are non-conforming, but are a common design due to high temperatures). Building materials themselves may therefore not be an entirely appropriate indicator of housing quality.

Figure 9.21: Semi-permanent housing, Mwamatope (near the dyke)

Photo credit: Author (2017)

Figure 9.22: Semi-permanent housing, Mwahimba (in the lakeshore area)

Photo credit: Author (2017)

Figure 9.23: Typical housing, Luhimbo 2 (near the town centre)

Photo credit: Author (2017)

Housing conditions in formal settlements are relatively consistent given their planned nature, but some have begun to fall into disrepair in the absence of proper maintenance. For example, a medium density housing estate built for hospital staff in Malema 2 has begun to deteriorate (Figure 9.24), while a medium density development next to it remains in near new condition (Figure 9.25).

Figure 9.24: Medium density housing, Malema 2

Photo credit: Author (2017)

Figure 9.25: Recently constructed medium density housing development, Malema 2

Photo credit: Author (2017)

The most noticeable variations in housing conditions tend to be found in higher-income planned settlements with low density layouts. For example, many large well-constructed permanent houses in Bwiba co-exist alongside smaller and more poorly constructed semi-permanent

houses (Figure 9.26). (This arrangement is common in many high-income residential areas where caretakers typically live on site).

Figure 9.26: Differences in housing conditions in a low density formal settlement, Bwiba

Photo credit: Author (2017)

Some Traditional Housing Areas (THAs) that were upgraded under the Secondary Centres Development Programme (SCDP) have declined into 'slum' conditions due to the overdevelopment of plots, increasing overcrowding and pressures on overburdened services, notably sanitation (Figure 9.27).

Figure 9.27: Overdevelopment of a plot in a THA, Mwafilaso

Photo credit: Author (2017)

Overcrowding

Overcrowding is a growing problem in many villages that are informally densifying in the face of mounting land pressures. Informal observations indicate that population densities vary within villages. For example, there is high density in some parts of Mwanyesha near the town centre (Figure 9.28), while parts closer to the dyke are less dense (Figure 9.29).

Figure 9.28: Densification, Mwanyesha

Photo credit: Author (2017)

Figure 9.29: Low density housing, Mwanyesha

Photo credit: Author (2017)

FAPO with HSAs indicated that overcrowding is linked to informal subdivision. For example one plot in Malema 2 contained a single-detached house constructed of permanent materials and a row house with four units made of semi-permanent materials (Figure 9.30). The row house was served by one pit latrine, while the single-detached home was served by a flush toilet. Overcrowding may therefore be exerting increasing pressure on sanitation facilities, posing a particular challenge where land is scarce.

Figure 9.30: Subdivision of a plot containing a row house and single-detached dwelling, Malema 2

Photo credit: Author (2017)

Overcrowding combined with unsanitary conditions contributed to the cholera outbreak in villages along the lakeshore area, where most reported cases were concentrated, as discussed above. A study of Mwawembe, one of the villages affected in the lakeshore area, found that 54% of households lived in houses with five or more people, 67% had no toilet facility, and 68% of those households shared with neighbours (Manda et al. forthcoming).

Indoor air pollution

Indoor air pollution from household energy use contributes to acute respiratory infections, chronic obstructive pulmonary disease (COPD), lung cancer (from coal use) and low birth weights (Haines et al. 2013). The survey by Manda and Wanda (2017) found that most households in Karonga Town rely on dirty cooking fuels, with 48% relying on firewood and 46% who rely on charcoal. Only 4% of households rely on electricity, while the remaining households relied on paraffin and 'other' (not specified) at 1%, respectively (Table 9.4). Risks associated with

fuel poverty are heightened where average and extreme temperatures are high and ventilation is poor (Hardoy et al. 2001).

Table 9.4: Sources of energy for cooking and lighting in Karonga Town

Energy used for cooking		**Energy used for lighting**	
Source	*% of population*	*Source*	*% of population*
Firewood	48.4	Firewood	0.8
Charcoal	46.4	Paraffin	1.6
Paraffin	0.5	Electricity	38.0
Electricity	3.9	Solar powered bulbs/torches	9.9
Other	0.8	Battery bulbs/torches	44.3
Total	100	Cell phone torches	2.3
		Straw/uteka/udzu	1.0
		Other	2.1
		Total	100

Source: Manda and Wanda (2017)

Drainage

The town lacks a proper drainage network, contributing to flooding, waterlogging and standing pools of water that provide vector reservoirs for mosquitoes and pests. Existing drains are often blocked with solid waste, attracting children who scavenge for recyclables (Figure 9.31). Some drains have become so overgrown that they are difficult to even see (Figure 9.32). The drainage channels constructed as part of the flood mitigation project in the 1980s are also poorly maintained, causing siltation.

Figure 9.31: Children scavenging for recyclables in a blocked drain in the town centre

Photo credit: Author (2017)

Figure 9.32: Segment of an overgrown drainage channel cleared by maintenance

Photo credit: Author (2017)

Solid waste management

The town lacks a solid waste management, solid waste dumping sites, and waste collection vehicles. There is only one waste collection point, which is located in the market, and only one

tractor for collecting its waste. Most households and businesses burn, bury or discard their waste in open spaces, pits and drains. Informal observations reveal the prevalence of debris and rubbish concentrated in and around the market, roads, drains and drainage channels, rice and maize mills, and residential and commercial plots (Figure 9.33).

Figure 9.33: Open burning of solid waste adjacent to offices in the town centre

Photo credit: Author (2017)

Environmental degradation

Environmental degradation is becoming a problem as the demand for land and housing continues to grow in the absence of proper planning and environmental protection. Of particular concern are the growing number of brick moulding pits that not only degrade the environment by extracting soil, but also fill up with water during the rainy season, providing a breeding ground for mosquitoes (Figure 9.34). Chiefs report that many children have drowned after falling into the pits during the rainy season (field notes, 2017).

Figure 9.34: Brick moulding pit, Mwanyesha

Photo credit: Author (2017)

Soil type

While not a hazard in themselves, alluvial soils cover much of the town. While the soil is fertile and supportive of agriculture, it does not support sound building and construction. The prevalence of sandy soils, particularly in the lakeshore area, combined with the town's high-water table poses a major challenge in constructing permanent safe and more durable toilet facilities, as discussed above.

9.1.5 Poverty and gender

The survey by Manda and Wanda (2017) uncovered high levels of income poverty in the town, with 34% of households earning less than MK 10,000 per month (less than USD$ 14), 30% earning between MK10,000-29,000 (around USD$ 41), 20% earning above MK50,000 (around USD$ 69) and 16% earning between MK30,000 and 49,999 (less than USD$ 69). Most households therefore earn below MK29,000 (around US$ 14) per month, amounting to less than half of the conventional dollar-a-day poverty line.

Low-income households continue to experience added financial pressure since the uranium mine was opened at Kayelekera. Residents attributed rising food costs in the central market to the influx of well-paid miners willing to pay more than market prices for food, particularly chickens and bags of maize, highlighting the critical link between food security and affordability.

Residents also attributed rising housing prices to increasing demand among miners (field notes, 2017). While the mine is no longer operational, the cost of living has remained high as demand for goods and services has continue to rise with the town's growth. Consequently, it has become increasingly difficult for many low-income households to meet their basic needs for food, water, housing, electricity and other goods and services of critical importance to environmental health. Disruptions to income-earning as a result of sickness or injury pose major threats to overstretched household budgets.

At the same time, the pace of urban growth has far outstretched the capacity of the District Council to provide sufficient infrastructure and services. Resulting environmental problems, especially in traditional/non-statutory settlements, present different health risks for certain people. It was expected that women would be found to suffer disproportionately from acute respiratory infections since they are typically responsible for cooking and since many households rely on biofuels (wood and charcoal) (field notes, 2017; see also Manda and Wanda 2017). However, the hospital records indicate that a larger share of men suffer from acute respiratory infections as well as injuries than women. This could be explained by the tendency of women in households to cook outdoors given the availability of open space in many villages (Figure 9.35) and so may not face heightened exposure to air pollution from biofuels.

Figure 9.35: Open space outside a home, Mwahimba

Photo credit: Author (2017)

The prevalence of acute respiratory infections and injuries among men could be explained by their tendency to work as manual labourers, potentially heightening their exposure to

particulates in the air, injuries and road traffic accidents. Conversely, women constitute most vendors in the town, many of whom operate next to the market's solid waste collection point, which is near an abattoir and open drains. Their working environment may thus heighten their exposure to biological pathogens associated with liquid and solid waste. Many women who are married have husbands who work as farmers and fishermen and are responsible for selling what their husbands grow and catch (field notes, 2017). The gendered division of household labour may therefore expose women and men to different types of occupational hazards outside the home. Structural transformation may lead to changes in these exposures depending on the participation of women and men in the non-farm economy, although this observation requires further research to validate.

9.1.6 Institutional constraints

Despite Karonga Town's importance, the District Council has been unable to plan and manage its growth, provide basic infrastructure and services and adapt to emerging environmental hazards due to institutional constraints at all levels.

Institutional constraints at the national level

The inability of the national government to successfully implement several national policy and legislative frameworks has significantly constrained the effectiveness of urban planning in Karonga Town, among other urban centres in Malawi:

- ***The National Decentralisation Policy of 1996*** devolves administrative and political authority to the local level, but the continued unwillingness of national government to devolve power and resources to the local level has hampered its implementation. Physical planning has been hard hit due to its already weak capacity.
- ***The Local Government Act of 1998,*** in conjunction with the Decentralisation Policy, devolves local planning and project implementation to the local level, but the refusal of the national government to hold local elections since 2005 effectively undermines local planning. Although local elections were reinstated by national government in 2014, they have not been held in Karonga Town, which still lacks an elected Town Council.
- ***The Town and Country Planning Act of 1981*** is the primary policy for physical planning and development control, but it does not outline any mechanism for plan implementation.

- ***The NPDP of 1987****,* which promotes decentralised urbanisation through investment in secondary towns and rural growth centres, but has been undermined by the concentration of infrastructure investment (particularly roads) in the Southern Region (field notes, 2017; see also Manda 2013).

The constraints above undermine reforms to the T*own and Country Planning Act* of 1988, which was introduced under the first post-independence president, Kamuzu Banda, to increase grassroots participation in decentralised planning processes and to distribute the benefits of urbanisation in rural areas, in line with the objectives of the NPDP of 1987 (Luka 2010). While the reintroduction of multi-party elections in 1994 and the subsequent enactment of the *Local Government Act* in 1998 marked a significant step toward democratisation, the decentralisation of responsibilities and funding to local authorities as part of an 'enabling approach' to participatory urban planning has been minimal (Manda 2013). According to Luka (2010) "despite the legal and structural reforms toward decentralisation of power to local urban authorities, no evidence exists of serious attempt to improve urban governance by any multi-party era government in Malawi" (ibid: 9).

Institutional constraints at the regional level

The most neglected of Malawi's three political regions (North, Centre and South) is the North, which has historically been a net loser of population due to out-migration to other regions and abroad (Manda 2013). Most population growth and infrastructure investment has been concentrated in the Southern Region, which also contains most of Malawi's urban centres (including Blantyre and Zomba) and urban population, as discussed in Chapter Five (section **Error! Reference source not found.**.1). Without equivalent investment in the North, regional disparities in urban development could become worse, despite the growth of Karonga Town, Mzuzu and other Northern urban centres.

Institutional constraints at the District and local level

The Karonga District Council has been responsible for implementing urban policies (including the 2013 Urban Structure Plan) for the town since the Town Council was dissolved in 2005. The Town Council was subsequently subsumed within the District Council, which now is located in the former Town Council offices (Figure 9.36). Since the District Council governs the entire district, encompassing a vast rural territory, urban development issues must compete with rural development issues for scarce funding from the District budget, which is almost entirely reliant on central government transfers (field notes, 2017). Without a local governance structure

beneath the District level, Karonga Town lacks the institutional basis to plan and manage urban growth, provide basic infrastructure and services, and adapt to emerging environmental hazards.

Figure 9.36: Former Town Council now occupied by District Council

Photo credit: Author (2017)

9.1.7 Conflicts between society and governance

Conflicts between stakeholders involved in urban planning and development, notably government officials, community members and chiefs, are worsening. These conflicts threaten to undermine the urban planning system by lessening the possibility of collective action. The consequences for environmental health could be significant if planning suffers as a result. Several areas of conflict raise concern.

Conflicts over the control of customary land

Rising land pressures driven by urban growth have created new land management challenges for chiefs at the village level. Some chiefs have enacted by-laws prohibiting the sale of land purportedly to prevent informal subdivision, but also likely as a means of protecting their power over land allocation (field notes, 2017). In other cases, chiefs are losing their control as customary land commercialises. For example, mounting land pressures in Malema 2 have motivated many customary land holders to informally subdivide their plots for sale or lease, resulting in overcrowding, as discussed above. Consequently, decisions about land management

are increasingly being made by individuals and households rather than by chiefs in some villages, giving rise to more individualised forms of land tenure. Conflicts could foreseeably emerge between older and newer generations of land holders with increasingly limited land access opportunities.

Conflicts could also emerge between chiefs who may be increasingly tempted to sell lands for housing developments and physical planners and lands officers attempting to implement layout plans to limited effect. Such conflicts have begun to emerge in Bwiba, where the chief has become increasingly "enterprising" in real estate, according to one Lands Officer (Interview 12, 05 August 2017).

Conflicts over relocation

To plan urban expansion, the 2013 Urban Structure Plan extended the town's administrative boundary to make new land available for future population growth in safer areas away from the North Rukuru River. Following the flood disaster in 1979, large swaths of the lakeshore area, including much of old town, were designated as flood-prone areas. It is now the policy of the plan to relocate the population so that flood-prone areas can be developed into "public open spaces for recreation" (Ministry of Lands and Housing 2013: 36). The plan assumes that communities in flood-prone areas would be willing to voluntarily relocate to safer areas, although most prefer to remain (field notes, 2017). Meanwhile, the District Council has continued to allocate land in these areas (as in the case of the primary school in Kafikisila village). As the Head of the Physical Planning Department explained:

> "Unfortunately, there has been a lot of resistance in Karonga. Actually you find that because these disasters or floods come after so many years. People forget; they will think […] maybe it is a once in a while thing, and they see land that is remaining idle, there are some interests, and you find that our sister departments, maybe the [District] Council and the [Ministry] of Lands, will proceed to allocate lands that we have designated as a risk area" (Interview 1, 17 February 2017).

Typically, communities refuse to relocate based on concerns over compensation, and the perception that the most important risks they face are loss of livelihoods and decreased proximity to trading centres. The tradition of burying their family members close to their home is also an important reason why they cannot leave (Figure 9.37). As one chief explained:

> "Yes of course, the government insisted that people should move from this area. Go to other areas, way upwards there […]. But we say that this is our forefathers land. We

cannot move from this to other places. If we must die, let us die here. That is why we put graves here next to our houses. When they say we should go upland, I said no I cannot leave my forefather's graves here. Yes, we are sitting on graves" (Interview 9, 06 August 2016).

Figure 9.37: Graveyards around homes, Mwamatope

Photo credit: Author (2017)

In Mwahimba, which encompasses a large share of the lakeshore area, chiefs justified their refusal to relocate by suggesting that the area in which the District Council offices have been relocated to are now flooded every rainy season, whereas old town is not. One traditional leader explained the situation:

> "We were with the District Commissioner, all of the District Councillors…. They said no, no you should move a little bit to this area... Now when we are talking about floods, we are talking about the market. There are floods all over, the 2011 floods. That is the place that the District Commissioner's office has been moved to…. It is claimed as a safe place. And we should move away from here when they are also in water? The government has to commit itself to think of plans... In smaller places in Europe, you find they are building in water and they don't run away into upper areas. They say this is the only place we have so we have to think to improve it" (Interview 10, 06 August 2016).

Given the refusal of communities to relocate, planners are calling for new legislation that would give them powers to declare disaster-prone areas as 'no go zones'. As the Head of the Physical Planning Department explained:

> "… the plans that we prepare are not supposed to be just advisory, they are supposed to be legal instruments, but sometimes people insist that, Ah, no no, I will put masonry here, I protect and put a retaining wall here, and floods can't come her. But later still things happen" (Interview 1, 17 February 2017).

This quote expresses not only a frustration with the lack of legal mechanisms to enforce planning, but also a lack of confidence in the ability of communities to reduce risk themselves. Ultimately, it is difficult to imagine how the Urban Structure Plan could have an impact on reducing risk as long as it relies primarily on voluntary relocation, and as long as communities remain primarily concerned with preserving their livelihoods, access to markets and cultural traditions in the settlements in which they have always lived.

Conflicts between the public and officials over the alleged misuse of public funds

Since the Town Council was subsumed within the District, the town has been forced to rely on a single planner for the entire District. The planner was transferred to the Regional Physical Planning Department in Mzuzu in early 2017 after he and six other District officials (including the Director of Planning and Development) were arrested on corruption charges in September 2016. It was alleged that over 25 million Malawi Kwacha (MWK) (around $US 3,450) out of 57 million MWK (around $US 7,860) earmarked for public works under the Malawi Social Action Fund (MASF) 4 was misused (field notes, 2017). But after a financial audit found no evidence of wrong doing, the planner was transferred over security concerns. According to conversations with Lands Officials, the public became angered by a report authored by the planner listing projects completed under the Local Development Fund (LDF) that were found not to exist on the ground, leading the planner to be "chased out of the town" (Interview 12, 05 August 2016).

Conversations with planners familiar with the case suspect that the decision to transfer the planner was political. Their suspicion arose when some District Councillors accused the planner of being "an enemy of development" after he made written statements against the market stall expansion project (field notes, 2017), as discussed above. The physical planner explained the situation:

> "[The councillors] saw I was out [of town]... So, when I was coming back from Lilongwe, that was around 11 o'clock, midnight, I found vehicles all over erecting construction signs. Vehicles were on the other side of the road. People were busy constructing at night. By the time it was the morning, all structures were completed… we had the police, and the

police were also vulnerable, they could not do anything, but it happened" (Interview 14, 08 August 2016).

The increasing lack of public trust in planning officials combined with the view that planning represents a constraint on development raises serious concerns as to whether it could be effectively implemented under present circumstances.

Conflicts between market vendors and shopkeepers and the District Council

Market vendors and shop keepers have become increasingly dissatisfied with the failure of the District Council to fulfil its duty to provide services (namely solid waste collection) and prevent seasonal floods in and around the market. Frustrations reached a tipping point following a flood that consumed the market and its surrounds during the night of 16 April 2017 (Figure 9.39-9.39). The market vendors and shopkeepers responded by boycotting the fees they pay to the District Council, including:

- Daily market fees for vendors (MWK 120 or US$ 0.17) and shops (MWK 150 or US$ 0.21)
- Monthly rental fees for shopkeepers (MWK 4,000 or US$ 5.5)
- Monthly electricity fees for shops with electricity connections (MWK 1,500 or US$ 2.1)

Figure 9.38: Flooding in the market, 17 April 2017

Photo credit: Wisdom Bwanali (2017)

Figure 9.39: Flooding outside the market next to the waste collection point where the informal vendors operate, 17 April 2017

Photo credit: Wisdom Bwanali (2017)

The market chairman explained the relationship between the market and the District Council:

> "As people who sell goods, our relationship is very good with them. But because people from the Council see themselves as educated and because they see that vendors do not have an organisational body to speak for them, that's why they don't even bother. For example, there were floods in Kaporo [a rural area in Karonga District] last week. The Vice President went there, but nobody, not even the Council, came to see us when the market area was flooded with water. So we seem to have a good relationship with them even though the Council treats us as if there is no relationship… As Malawians, we also need support when we are effected by floods" (Interview 15, 26 April 2017).

The Council held an emergency meeting to appease the market vendors and shopkeepers, assuring them that services would improve. The market subsequently resumed paying fees, but it remains to be seen whether relations between the market and the Council will remain stable so long as service delivery remains inadequate.

9.2 Interactions between environmental health determinants in Karonga Town

The analysis above reflects a shift away from viewing health as a biological characteristic toward viewing health as influenced by the larger living environment and the processes, institutions and relations that shape it (Galea et al. 2005; Kjellstrom and Mercado 2007; Mitlin and Satterthwaite

2013; Vlahov et al. 2007). This shift has been motivated by the growing debate on the social determinants of health reviewed in Chapter Two (section **Error! Reference source not found.**). However, as Glouberman et al. (2006) argue, these determinants:

> "do not just have an 'impact' on individual health, but interact with the individual and with each other in complex and often unpredictable ways and change over time as the entire system adapts. Thus, the language of 'determinants' of health, with its suggestion of mechanistic, linear, one way relationships, constant over time, may be misleading" (ibid: 334).

Following Glouberman et al. (2006) and others (Rydin et al. 2012), this section uses the ecological lens outlined in Chapter Three (section 3.1.3) to understand how the determinants of environmental health interrelate, overlap and mutually reinforce one another in complex systems. The framework is illustrated in Figure 9.40 based on the analysis thus far. The diagram was iteratively developed throughout the course of the field work in light of new observations, and is presented in its original form to emphasise the organic nature of its formulation.

Figure 9.40: Fieldwork illustration of the interactions between the many determinants of environmental health in Karonga Town

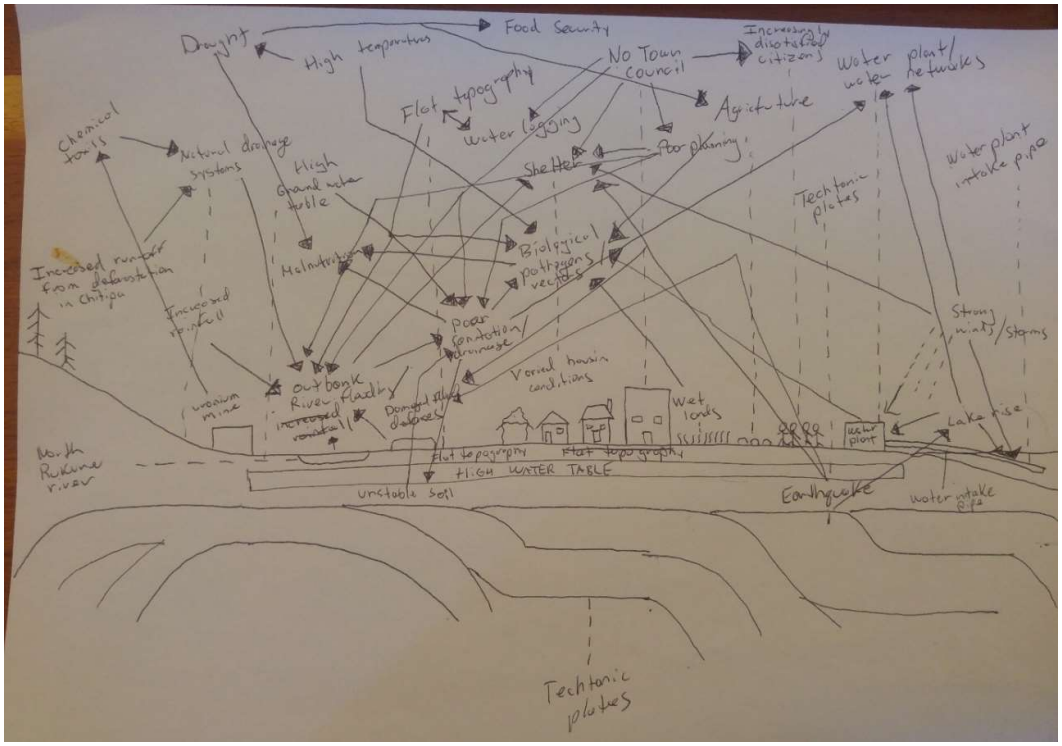


Diagram by author

The interactions between the determinants of environmental health in the town fall into two main categories: (a) interactions between aspects of the environment that affect health; and (b) interactions between the institutions that influence the environment and related health outcomes. The complex nature of these interactions, discussed below, highlight the need to understand environmental health in socio-ecological systems.

9.2.1 Interactions between the environment and health

Several interactions between the environment and health in the town are observable in Figure 9.40.

Environmental hazards interact in overlapping and mutually reinforcing ways

Seasonal flooding and waterlogging during the rainy season in the absence of drains regularly damages and destroys traditional pit latrines, leading to the cross-contamination of water and sanitation systems and related diseases (diarrhoea, intestinal worm infections) in many villages. In turn, poor sanitary conditions may contribute to malnutrition among susceptible groups, including infants and children and people with pre-existing health conditions (HIV/AIDS, anaemia), and to cholera outbreaks during the rainy season, reinforcing a vicious cycle of ill-health linked to biological pathogens.

Interactions between environmental hazards can lead to cascading infrastructure failures

The 2009 earthquake destroyed part of the dyke, contributing to the 2011 floods. Seasonal flooding and waterlogging has continually damaged and destroyed traditional pit latrines, which many households choose not repair or rebuild due to the inconvenience and cost. A lack of a consistent energy supply has resulted in frequent water cuts, particularly during the dry season, while tidal currents have damaged the water plant's intake pipes, causing service disruptions that force households to rely on unsafe sources. Out-bank river flooding threatens to damage and destroy public facilities, including the primary school constructed in the flood plain, threatening public health and causing disruptions to critical services, such as education.

Environmental hazards vary depending on local circumstances

While flooding is among the most prevalent hazards in the town, not all villages are equally exposed. Villages close to the dyke are regularly exposed to out-bank river flooding during the rainy season, while villages along the lakeshore area are exposed to episodic lake rise. However, parts of the lakeshore area close to the flood plain, including the site where the primary school

was constructed, may become exposed to out-bank river flooding if the dyke continues to erode. Other low-lying areas and areas with poor drainage, including the market, with poor drainage are regularly exposed to seasonal floods from heavy rainfall, whereas elevated areas, including Bwiba, are not.

Levels of service provision have had significant impacts on vulnerability Some villages contain highly dense pockets of poor housing and sanitation, while housing elsewhere is less dense and better served, as observed in Malema 2. Drainage systems near the dyke that do not cover the entire area, rendering some households more exposed than others, as observed in Mwamatope.

Feedback loops have different effects on environmental health

Negative feedback loops maintain equilibrium, for example, maintaining the dyke and drainage channels would help to prevent out-bank river flooding. Conversely, positive feedback loops can lead to irreversible instability, for example, the encroachment of drainage channels compromises their functionality, leading to uncontrollable flooding. Planning interventions intended to maintain equilibrium or reduce instability may have unintended consequences, for example, repairing the dyke could exacerbate flooding in villages that have emerged on its opposite side.

When parts of a complex system are seen separately, projects fail

NGO projects aiming to improve access to sanitation in ill-served villages through the construction of permanent pit latrines have been implemented without considering a combination of inter-related socio-economic and environmental factors, including flood exposure, high water tables, unstable soils, household resource constraints, and the appropriateness of technology. Consequently, new latrines have collapsed, while many households have failed to construct or repair them due to a lack of resources. The inter-relations between these factors means that projects seeking to enhance access to safer toilet facilities must adopt a non-linear approach.

Many environmental interactions hinge on poor sanitation

Poor sanitary conditions interact with flooding and waterlogging when pit latrines overflow; when faecally contaminated flood waters consume residential areas and flow into nearby streams and percolate through the soil down into groundwater; pit latrines collapse due to unstable soils; and pit latrines are clustered in dense pockets of housing. These conditions contribute to water- and sanitation-related diseases (diarrhoea) that may contribute to other

conditions, such as malnutrition, among susceptible groups (infants and children). Tackling bad sanitation requires collective action at the neighbourhood scale since the incentives to improve toilet facilities are minimal at the household scale. Furthermore, households may see no value in improving their facilities if their neighbours have not done so. Sanitation must therefore be addressed both at the household and village/neighbourhood scales.

9.2.2 Interactions between the institutions that influence environmental health and related outcomes

Several interactions between institutions and stakeholders that influence environmental health are evident from the analysis above:

Existing interactions between stakeholders are not conducive to networked responses

Chiefs have refused to accept the provisions in the new *Land Act* due to a lack of consultation, public anger over the misuse of the LDF led to the transferral of the physical planner from Karonga Town to Mzuzu, market vendors and shopkeepers have boycotted the payment of fees to the District in protest against its inability to prevent seasonal floods by delivering basic services, and the commercialisation of customary land may lead to new conflicts between informal land holders, chiefs, and physical planners and lands officers.

At the same time, physical planners and public health officials do not regularly communicate due to the fragmented nature of their work; whereas physical planners focus on land acquisition and layout planning (where their limited capacity permits), public health officials focus on the delivery of health care services at the hospital and community level. None of these interactions are conducive to the type of networked responses that are required to coordinate the multiplicity of stakeholders involved in urban planning and public health in the town.

9.3 Limitations

The analysis in this Chapter faced two main limitations. First, multiple datasets (quantitative and qualitative) were combined at different spatial and temporal scales in an effort to provide a detailed picture of Karonga Town's environmental health situation on the ground. For example, the archival research of hospital records was longitudinal, whereas the FAPO with the HSAs was cross-sectional. While the data may not always correspond to the same time period, they provide different perspectives on the problem under investigation.

Second, while the combination of datasets afforded different analytical perspectives, it did not reveal causal connections between observed environmental health outcomes and their direct causes. This, however, was not the purpose of the analysis. The purpose was rather to assess environmental health outcomes and their known determinants as they interact at multiple scales using a quantitative and qualitative methods.

9.4 Discussion

The strong relationship between ill-health and local environmental hazards observed in Karonga Town supports the hypothesis that environmental health risks form a wide spectrum and may be heightened in similar towns lacking capacities to plan and manage urban growth, provide services, and adapt to emerging environmental hazards, including disasters and climate change, as discussed in Chapter One (section 1.1.3). This observation is particularly concerning given Karonga Town's rapid growth, which threatens to reinforce emerging processes of urban risk accumulation at the expense of the town's development, with potentially significant consequences for the North as the least urbanised and developed region.

While the growing interest in policy and academic circles on urban and 'slum' health in large metropolitan centres represents a welcome development, as discussed in Chapter Two (section 2.1.4), more attention needs to be paid to the relationship between urbanisation and population health patterns and trends at different levels of the urban hierarchy. Whether the nature and scale of urban health risks and outcomes linked to environmental hazards in Karonga Town may be similar in other smaller Malawian towns remains unclear in the absence of detailed demographic and health data of the kind presented in this and the preceding three Chapters. The adoption of the four tier settlement hierarchy by the NSO and the physical planning department marks an important opportunity to generate this type of data and to use it for both statistical and policy purposes, as discussed in Chapter Six (section 6.5).

The Chapter contributed to the conceptual advancement of urban health analyses by drawing on complexity thinking to view Karonga Town as a socio-ecological systems shaped by processes of in situ urban change. This analysis was guided using the ecological lens outlined in Chapter Three (section 3.1.2), which enabled a 'causal web analysis' of the multiplicity of interacting determinants of environmental health at different scales, as illustrated in Figure 9.40. The advantage of using this approach to analyse health problems with known environmental causes is that it allows for attendant causes linked to structural factors beyond immediate environment to be considered holistically.

For instance, as a water-borne disease, cholera is chiefly caused by poor water and sanitation in combination with poor liquid and solid waste management and tends to spread in ill-served settlements exposed to floods (Hardoy et al. 2001). The analysis of cholera outbreaks in Karonga Town revealed the complex interactions between the immediate environmental causes of cholera outbreaks and numerous attendant causes, including the livelihoods of fisherman forced to defecate in the lake because fishing camps lack toilet facilities; the prevalence of sandy alluvial soils that are good for agriculture, but inappropriate for construction; the lack of resources available to households to afford piped water connections and the most basic toilet facilities; and the reluctance of officials to provide services to villages located in areas deemed to be 'disaster-prone'. These determinants (socio-economic, environmental, institutional and political) combine to reproduce cholera outbreaks on a seasonal basis in certain villages that are known to be disproportionately affected, but that are only supported in the aftermath of disease outbreaks where the principal objective is humanitarian (distribution of chlorine tablets, the delivery of safe hygiene messages) rather than developmental (the provision of risk-reducing infrastructure and services that are tailored to local circumstances).

Adopting complexity thinking to address cholera, among other multidimensional environmental health problems (epidemic and endemic), requires a shift away from linear, deterministic approaches that focus narrowly on individual determinants and that respond retroactively. For instance, the construction of permanent pit latrines by the Red Cross in villages affected by the 2010 earthquake, and their subsequent collapse, reflects a failure to recognise the multiplicity of factors that influence sanitation at the household and village levels, notably the ability and willingness of households to maintain, repair and reconstruct toilet facilities in flood-prone areas.

Complexity thinking requires a shift toward more holistic, non-linear approaches that understand the environmental causes of disease in relation to socio-economic, institutional and political causes at multiple nested scales. Such approaches require integrated interventions that address many key environment and development issues, such as the provision of basic infrastructure and services, housing construction, land management, disasters, livelihoods, food security, and urban planning and governance, highlighting the importance of approaching environmental health from a multidisciplinary perspective.

9.5 Conclusion

This Chapter explored the determinants of environmental health and their complex interactions in Karonga Town from an ecological perspective. The findings highlight the need for a holistic

approaches to understand and address multidimensional environmental health problems, but also the challenges facing these approaches in highly political decision-making environments. To better understand these challenges in Karonga Town, the following Chapter provides an in-depth analysis of the town's planning system with the aim of better understanding the prospects for planning healthy urban environments in this context.

Chapter 10 Prospects for planning healthy urban environments in Karonga Town

This Chapter uses the institutional lens outlined in Chapter Three (section 3.1.3) to explore the prospects for planning healthy urban environment in Karonga Town. The lens posits that these prospects depend not only on physical interventions (the traditional focus of planning), but also changes to the institutional context in which urban planning systems are embedded (Corburn 2009). Here, 'urban planning systems' refer to the various institutions that influence urban planning and development processes (formal/modern and informal/traditional), and 'institutions' refer both to wider norms (rules of the game) and practices (what is done) and to formal planning agencies (UN-Habitat 2009). In this way, urban planning systems are seen as a form of urban governance, referring both to the proliferation of stakeholders—of whom government is only one—in urban planning and development processes and to an alternative mode of governing (ibid; Watson 2009). Whether or not urban governance promotes population health depends both on the quality of the urban environment and the institutions that shape the distribution of that quality in particular places and across particular populations (Corburn 2009).

The Chapter is comprised of five sections. Section one explores the governance challenges that processes of in situ urban change are presenting for efforts to plan the growth of Karonga Town once it already emerged. Section two explores the impacts of the dissolution of the Town Council on the urban planning system and the institutional context in which it is embedded. Section three assesses the links between Karonga Town's planning and public health systems. The gaps between these systems are revealed and the institutional barriers for supporting a joint approach discussed. The fourth section discusses the prospects for planning a healthier town environment at the lowest possible level, addressing the fifth research objective:

- To understand the prospects for planning a healthy environment in Karonga Town through an analysis of the evolving institutional context in which its urban planning system is embedded.

The final section concludes by emphasising the need to understand how in situ urban change is transforming rural governance regimes and resulting in new challenges for urban planning systems and the evolving institutional environments in which they are embedded. The Chapter draws on interviews with government officials and local leaders as well as published literature

to incorporate insights from other researchers. The main findings are synthesised in Chapter Eleven (section **Error! Reference source not found.**).

10.1 Planning finds the town: the challenges of in situ urban change

Karonga Town was first declared a Statutory Planning Area in 1991 under the *Town and Country Planning Act* of 1988. By then, its population was already around 19,000, up from around 11,000 in 1966 (Table 10.1). Thus, by the time planning "found the town", as one physical planner put it (field notes, 2017), Karonga Town was already an emerging urban centre with an established rural governance structure controlled primarily by chiefs, most of whom are hereditary given the North's low urbanisation level. In effect, the incorporation of the town as a Statutory Planning Area marked an attempt by the government to extend its control over the town through the formalisation of land markets and the imposition of a new urban governance structure grounded in formal rules and regulations. This observation provides evidence to support Cammack's et al. (2009) contention that "There appears to be a difference between traditional authorities who have been 'found' by towns/continue to exercise jurisdiction within towns–a type that maybe more prevalent in the less urbanised North–and local leaders in towns who have been 'created' by officialdom and/or residents to fill a gap and are modelled on traditional chieftaincy" (ibid: 35), as discussed in Chapter Five (section 5.2.5).

Table 10.1: Population growth in Karonga Town, 1966-2008

Year	Population	Annual growth rate (%)
1966	11,242	N/A
1977	12,051	0.63
1987	19,630	3.1
1998	27,816	3.5
2008	41,074	4.3

Data source: NSO (1998, 2008), presented in Ministry of Lands and Housing (2013)

Attempts to plan the growth of the town retroactively have led to mounting conflicts between pre-existing customary institutions and modern government institutions, as demonstrated by the examples documented in Chapter Five (section 5.2.5) and Chapter Nine (section 9.1.7). These examples include the refusal of chiefs to accept the New *Land Act* of 2017 since its provisions threaten to reduce chiefs' power over land; the conflicts that could emerge between chiefs who are beginning to sell customary land to private developers, and physical planners and lands officers struggling to implement layout plans; and conflicts between people who refuse to be resettled to safer locations if it required them to abandon their ancestral burial grounds, and government officials who believe people should live in disaster-free areas. These examples

demonstrate the confilicts that have arisen in the planning system with the process of in situ urban change, presenting major challenges for coordinated approaches to local governance.

10.2 Planning without a Town Council: the re-ruralisation of governance

Karonga Town's Local Council was dissolved in 2005 by the national government due to the perception among politicians that Local Councils are unnecessary and that Local Councillors represent a threat to national authority (Manda 2014), as discussed in Chapter Five (section 5.2.5). The local governance vacuum that was created as a result had major impacts on the town's planning system and the urban environment:

Loss of formal command-and-control power

Urban planning no longer has an implementation framework at the urban scale. Following the removal of the Town council, planning's functions were subsumed within the District Council, which employs only one Physical Planner responsible for planning issues in the entire District, encompassing a vast rural territory and several other small towns. Some of these towns should have urban structure plans (Chitipa and Songwe), but do not due to a lack of capacity (Interview 14, 08 August 2016). Since the planner was transferred to Mzuzu amid safety concerns following alleged corruption charges, as discussed in Chapter Five (section 5.2.5), the formal planning system has become further removed from the town. Meanwhile, in the absence of sufficient resources, the Town Planning Committee (responsible for reviewing planning and building application) now meets annually rather than quarterly as it once did, while the Plot Allocation Committee (responsible for allocating plots to interested people in newly planned areas) "is almost dead", according to the Director of Planning and Development (DPD) for the District (Interview 17, 17 July 2017).

District Officials have become increasingly frustrated with their inability to control urban development and prevent the spread of traditional/non-statutory settlements. One official blamed a culture of evasion for the situation:

> "… people are not following standards. This is a challenge. You can find that if you go into the township, the government is intending to demarcate plots so that people can build better houses. And you will find natives. You go with a grader trying to grade lots for a township to look neat, but you will find that people have encroached those places. Wherever you build a road somebody's building a house there. So it becomes a challenge to cooperate. So culture now comes in. So it is a something that is trying to defeat the

whole purpose of what you want a township to look like… It is culture versus the development we are trying to bring." (Interview 13, 05 August 2016).

While many government officials view stricter development control enforcement as the solution to the 'informality' they deride (field notes, 2017), the DPD explained that this would result in "war" with communities:

> "The relationship [between the District and communities] is a plastic one. It's a fake one because as a council we are not doing a lot of enforcement... Should we start biting, then the relationship will become sour because what we want to do is something that cannot make them happy. But by the end of the day the town and development will be organised and coordinated when we start biting. When we start for example to take our grader, tractor start demolishing structures and plant in new structures there will be a war [emphasis added]" (Interview 17, 17 July 2017).

At the same time, chiefs have become increasingly reluctant to accept the formal planning system. One GVH argued that his village is located outside the town's administrative boundary and is therefore not subject to its legal or regulatory framework:

> "… we are out of the town, but we are within the town… but the people living here feel they are not. We were here before the town's plans were drawn. The people came and then they said we are going to make Karonga a town" (Interview 9, 06 August 2016).

This quote is indicative of the political challenges of formalising a town after it has emerged without a formal planning system, highlighting the social relations and power dynamics that condition the effectiveness as well as the willingness to accept of such a system in urbanising rural territories. This observation suggests that a history of unplanned growth can significantly hinder efforts to institutionalise formal planning systems in situations where they come up against parallel systems based on pre-existing social rules and norms that may be more acceptable and legitimate than official rules and norms, discussed below.

Engraining fault lines in the planning system

The quotes above are indicative of four deepening fault lines in the town's planning system. The first fault line runs between the view held among government officials that people should live in "neat", "organised" and "coordinated" (read: planned) environments versus the reality of most indigenous people (the Ngonde) who live in traditional/non-statutory settlements on customary land (field notes, 2017). Reflecting the modernisation myth (Healey 2011), this view

implies that local culture is antithetical to development and that modernisation, through the technology of planning, is the only valid pathway forward.

This view is potentially dangerous if it is used to impose policies and plans that assume a form of living environment that local people would not necessarily want nor accept. This danger is evident in the 2013 Urban Structure Plan, which assumes that people would be willing to voluntarily relocate away from hazard-prone areas despite the importance of location for maintaining livelihoods (fishing, agriculture, vending) and local customs (burial grounds), as discussed in section seven (7.1.8). It could be argued that officials have appropriated the concept of risk to justify the imposition of order and control through relocation.

Here, it is important to clarify the terminology used throughout this thesis to refer to settlements that planners view as 'informal' (revisit Box 1.1). This view reinforces a binary that conflates informality with illegality/unacceptability and formality with legality/acceptability, while failing to recognise that many settlements deemed to be 'informal' were either constructed prior to the advent of a formal planning system or constructed in accordance with customary rules, norms and traditions. Thus, rather than referring to unplanned settlements as 'informal', they are referred to as 'traditional/non-statutory settlements' to reflect their origins and confer meaning to their histories. Unplanned settlements in other contexts are referred to as 'unplanned settlements', since their histories and natures are not fully known.

The second fault line runs between the inability to enforce development control and the unwillingness of local people to comply either for socio-economic reasons (many people would be unable to afford the costs of compliance, demonstrated in part by the large share of the population living in traditional/non-statutory settlements) or cultural reasons (grave yards are sacred to the Ngonde people, but are not recognised as a valid land use), as discussed in Chapter Five (section 5.2.1). Conflicting social norms between formal institutions that value order and control versus communities who assign cultural meanings to their environments and accept traditional rule pose major challenges for mobilising collective action to address the quality of the environment, especially when there is conflict.

The third fault line runs between the provisions in the *Town and Country Planning Act* of 1986 (section 33(1)-(6)) that do not recognise customary land or its allocation by chiefs in Statutory Planning Areas versus the prevalence of customary land in the town (declared a Statutory Planning Area in 1991) and the major role that chiefs play in land allocation (As previously stated, it estimated that 57% of households are estimated to live in traditional/non-statutory settlements on customary land – see Manda and Wanda, 2017). It is highly likely that chiefs

would vehemently oppose any effort by the District Council to acquire customary land for planning purposes (formal layout planning) given their opposition to recent legislative reforms aimed at curtailing their powers, as discussed in Chapter Five (section 5.2.5).

The fourth fault line runs between the town's largely unplanned growth versus efforts to plan the town retrospectively. The claim made by chiefs that the formal planning system does not apply to their villages because they are ostensibly located outside the administrative boundary, despite acknowledging that their villages are in the town, as discussed above, is indicative of the tensions and conflicts between the rationality of formal planning institutions to control and incorporate urban populations versus the rationality of customary institutions to maintain rural ways of governing in an urbanising environment. In this context, the absence of a Town Council has allowed chiefs to consolidate their power at the expense of the formal planning system.

Shifts in the balance of power at the local level

As major land holders and as gatekeepers to communities in the town, chiefs hold significant power over society and governance. As a result, development projects by non-governmental organisations (NGOs) or the District Council cannot proceed without receiving the approval of chiefs, who are heavily involved in decision-making processes and planning procedures at the VDC level and serve as gatekeepers for local projects, including Urban Africa Risk Knowledge (Urban ARK) (Figure 10.1).

Figure 10.1: Community meeting for Urban ARK led by a chief

Photo credit: Author (2017)

The town's three VDCs—Mwahimba, Mweninyumba and Katolola—are part of the District Development Planning System established to increase participation in decision-making at the grassroots level (field notes, 2017). VDCs serve as local platforms for communities to discuss problems (education, disease, sanitation, food security, floods, strong winds, fires), identify local development priorities and communicate them to the ADC, as discussed above. VDC meetings are held once a month and led by 10-12 elected community members (equal parts women and men) and an elected chairperson, many of whom are chiefs (Interview 9, 06 August 2017), despite policies discouraging this, as discussed in Chapter Five (section 5.2.5). As one chief explained:

> "I attend those meetings and get to speak there… We support the principal Group Village Headman [GVH]. If there are problems, we tell him, and call a meeting with people, to speak to people, and people speak their views. Some bylaws are made at the meetings to overcome the problem… Along the river, there were bylaws. There should be nobody cultivating 20 metres from the river. This is followed by everyone. No one misconducts the bylaws for the village headmen. If they do, they are required to compensate [pay a fine]" (Interview 11, 06 August 2016).

Chiefs also indicated that the District Council does not frequently participate in VDC meetings, even though they are responsible for organising them, and that it generally takes a long time for the District Council to respond to problems:

> "It takes time… sometimes we can all councillors and MPs [Members of Parliament] and sometimes they don't come. If they can come, they can say yes, we get your problem, you wait. So we keep waiting and waiting. Some do respond, but others do not" (Interview 11, 06 August 2016).

Through their involvement in local decision-making, chiefs have been able to negotiate for public facilities, as in the case of the primary school in Kafikisila village, as discussed in section four (section xxx). In that case, chiefs worked closely with District Councillors and MPs to find land and funding for the project through the Local Development Fund (LDF). As the GVH explained:

> "In our operations, we work closely with the councillors who identify projects. In fact, in the villages, we have priorities. A councillor will visit here and say what is our priorities... For example, now we asked the Member of Parliament to construct a school and it is being done now, it has just started. So the link between the chiefs and the District Commissioner

> [DC] is also through the councillors... So when you ask me about the DC, we work hand-in-hand" (Interview 10, 06 August 2016).

In the present circumstance, chiefs provide the main link between the District Council and communities and arguably have more influence on setting development priorities than their elected counterparts. Meanwhile, the District Council has lost much of its social legitimacy given its inability to provide services and prevent disasters through urban planning, as discussed in Chapter Five (section 5.2.5). Pre-existing forms of organisation based on customary institutions have subsequently grown in importance as a way of gaining access to urban resources (namely NGO projects and land) in the absence of a respected or socially legitimate local state.

Chiefs' role as gatekeepers and as *de facto* civil servants in VDCs reflect Eggen's (2011) observation in Zomba City (located in the Southern Region of Malawi) and its surrounding villages that where bureactratic capacity is weak, chiefs remain gatekeepers between government and communities, thus challenging the notion that chieftaincy and modern government represent parallel institutional structures, as discussed in Chapter Five (section 5.2.5).

Chiefs are, however, neither inherently democratic nor accountable: "As an institution of non-elected leadership with all-embracing powers and no institutionalised downward accountability, it [chieftaincy] represents almost the exact opposite of liberal democracy and the rights-based approach promoted by donors" (Eggen 2011: 323). Moreover, as UN-Habitat (2009) points out, customary practices are unlikely to "give consideration to the complexity of the way in which development and infrastructure relate to each other, and social, environmental and economic issues interact in urban environments" (ibid: 76). Addressing the complexity of these issues requires consideration of their complex inter-relationships and interactions at different scales (household, neighbourhood/village, town-wide, national and international), as discussed in Chapter Three (section 3.1.2).

Proliferation of service providers and fragmented delivery

A variety of service providers (particularly NGOs) have emerged to address local environment and development issues. But their activities tend to be fragmented and poorly coordinated (field notes, 2017). For instance, focus group discussions conducted by ReMapRisk—a research project led by the Development Planning Unit (DPU) under Urban ARK—in each village found that NGO projects are concentrated in areas where they already exist, thereby neglecting less-serviced areas (field notes, 2017). Inequalities in service provision—particularly water and

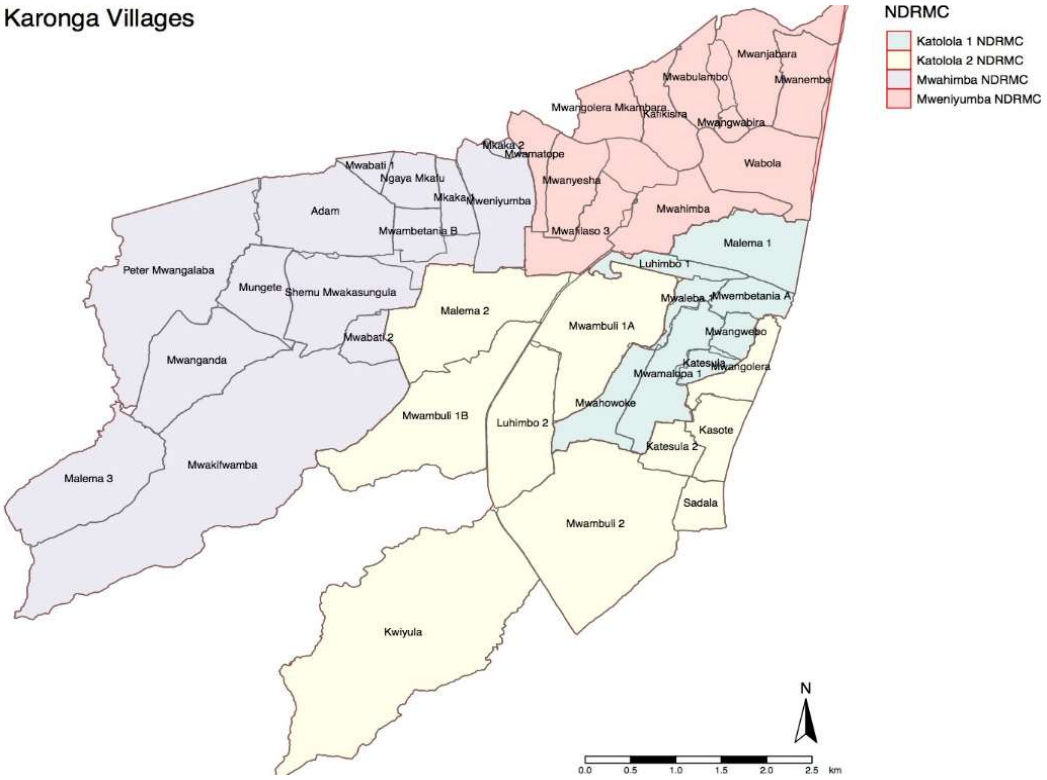
sanitation—risk intensifying existing environmental health inequalities between villages, discussed Chapter Nine (section 9.1.4).

Inequalities in service provision are also attributed in part to public utilities. Both the Northern Region Water Board (NRWB) and the Electricity Supply Corporation of Malawi (ESCOM) operate using a consumer-based model—whereby they provide services to those willing to pay for metred connections—and therefore do not benefit or actively seek out those who are unable to afford to pay for services or who live 'far from the pipes'. The survey by Manda and Wanda (2017) found that levels of provision of communal water taps (the main form of piped water connection in traditional/non-statutory settlements) are especially low in the lakeshore area, where the most ill-served fishing villages are located (field notes, 2017; see also Manda et al., forthcoming)). The influence utilities have on the quality of the living environment is thus fragmented.

The emergence of local committees

Neighbourhood Disaster Risk Management Committees (NDRMCs) represent a parallel platform to VDCs for addressing disaster risk management (DRM) at the local level. NDRMCs (also called civil protection committees) were recently established with the help of Mzuzu University to provide a platform to channel the learning generated through Urban ARK into urban DRM policy and practice. The NDRMCs operate at the VDC level, except for Katolola 1 and 2, which have their own NDRMCs due to their size (Figure 10.2). NDRMCs thus represent the lowest formal institutional structure in the town.

Figure 10.2: The four NDRMCs for Karonga Town



Source: ReMapRisk under Urban ARK, unpublished

The NDRMCs benefited from a capacity building project led by Mzuzu University in partnership with the Bartlett DPU called ReMapRisk in July 2017. The aim of the project is to break cycles of urban risk accumulation through strategic action planning processes led by communities trained to identify and map risks at the village level and to use the information to identify needed interventions at the local scale. The prospects that NDRMs present for planning a healthier and more resilient town environment are discussed below.

10.3 Links between the urban planning and public health systems for Karonga Town

The public health system for Karonga District is anchored by the Karonga District Hospital, which serves as a referral facility for the entire district. The hospital is located in the town near the airport, about 3.5 kilometres east of the town centre off the main road (M1) to Mzuzu. In addition to the hospital, the town is served by three outreach centres (the old hospital, Kachila and Lusubilo) run by Health Surveillance Assistants (HSAs) who work at the community level. The delivery of several public health services at the hospital and its outreach centres was observed (field notes, 2017):

- ***Curative health care***: Facility-based services (diagnostic, laboratory, blood bank, rehabilitation, physiotherapy) delivered at the hospital by medical professionals (doctors, nurses, clinicians);
- ***Primary health care****:* Services (civic education, community mobilisation, delivery of health messages, immunisation programmes) delivered primarily by HSAs in the community or at outreach centres mainly for the purposes of preventing disease among high-risk groups (infants, children, mothers, people with HIV/AIDS); and
- ***Contagion control****:* Delivered by the hospital and HSAs for the purposes of containing and preventing the spread of infectious disease outbreaks (cholera) through standardised procedures, including quarantine at the hospital and preventative health at the community level (safe Water, Sanitation and Hygiene (WASH) messages).

As frontline staff, HSAs provide a critical link between communities and the formal health care system at the grassroots level. While HSAs are not formally educated health professionals, they are trained by senior District Environmental Health Officers (DEHOs) to promote safe WASH, deliver health messages to pregnant mothers, check for stunting, deliver immunisations, support vector control, and conduct disease surveillance during outbreaks. HSAs have also established Village Health Committees (VHCs) comprised of small groups of elected community members who are trained by the HSAs to deliver health messages primarily related to WASH and nutrition. NGOs (such as the Red Cross) work with VHCs to plan and implement projects regarding WASH, food security and child health (field notes, 2017).

HSAs support a number of activities that attempt to address the quality of the physical environment at the village level. Several activities from FAPO stand out (all information presented in this section comes from my field notes (2017) unless otherwise specified):

Collecting household information to prioritise needed WASH interventions

Household surveys are a common tool used by HSAs to identify local health needs and prioritise WASH-related services. In Malema 2, the HSA was followed during the first day of a questionnaire survey he planned to administer to all households in the village (Figure 10.3). While administering the survey, the HSA took the opportunity to observe environmental conditions in and around each home and to deliver messages on safe WASH to household members. The survey thus served a dual purpose: to gather household information and serve as a vehicle for civic education.

Figure 10.3: The household survey designed and administered by a HSA, Malema 2

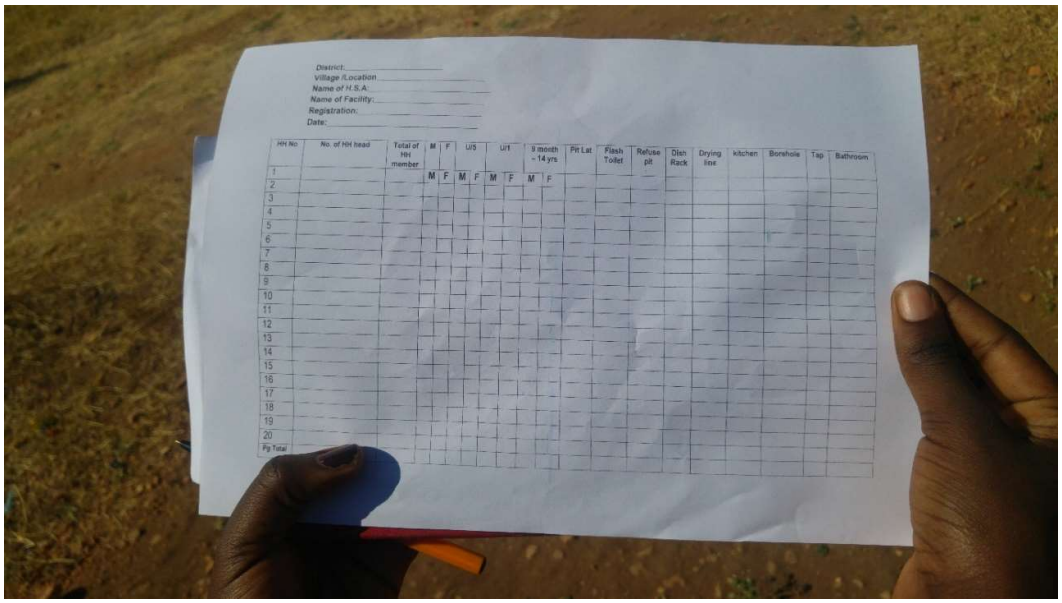


Photo credit: Author (2017), with permission

In Mwanyongo and Mwambetania, the HSA administered a survey to identify interventions aimed at improving sanitation. The survey showed not only a prevalence of temporary pit latrines, but also a lack of hygiene facilities in the community. Given the difficulty of improving pit latrines due to flooding and waterlogging during the rainy season, the HSA decided to tackle hygiene by training community members to construct a simple hand-washing facility that could be easily and cost-effectively scaled out to other households (Figure 10.4).

Figure 10.4: Hand-washing facility constructed by community members, Mwanyongo

Photo credit: Author (2017), with permission

Training households to improve WASH

The construction of the hand-washing facility pictured above entailed ten straightforward steps, taking no longer than 15-20 minutes to complete:

- Digging two small holes about two feet apart in a clear area next to a pit latrine;
- Inserting two sturdy sticks around two to three feet tall into each hole;
- Packing each hole with dirt to secure the sticks;
- Digging a small hole in the middle of the sticks and filling it with small rocks or broken bricks to allow the water to permeate the soil;
- Tying a string around the top of each stick to form a line;
- Puncturing two holes near the top of a plastic jug with a volume of around 500 millilitres;
- Inserting a string through each hole of the jug before tying the string to the line between the two sticks, allowing the jug to hang upright;
- Filling the jug with water;
- Perforating the jug's lid with small holes to allow water to trickle out; and
- Tying a string to the end of the stick before tying the other end around the jug's lid to form a lever to tip the jug over.

Once constructed, the hand-washing facility works by stepping on the lever, causing the jug to turn over and spill water into the hands of the user, limiting risk of contamination. The facility is maintained by re-filling the jug with clean water as required. HSAs have trained community members to construct similar hand-washing facilities in other villages, although the foot lever was an innovation the HSA from Mwanyongo and Mwambetania adapted from her home village in Mangochi (in the Southern Region). In Mwamatope, a VHC member tasked by the HSA to champion safe WASH reportedly trained each of the village's 600 households to construct their own hygiene facility (Figure 10.5), although it is not known whether all of them are maintained or used continuously.

Figure 10.5: Community volunteer demonstrating use of a hand-washing facility, Mwamatope

Photo credit: Author (2017), with permission

Following-up with households to ensure WASH improvements have been made

In Luhimbo 2, the HSA identified households with inadequate WASH facilities based on a questionnaire survey. The HSA approached each household to explain what improvements were needed, and why. The improvements included the construction of hand-washing facilities and the use of drop holes to cover pit latrines (Figure 10.6). The HSA and the households agreed on a period of time for the improvements to be made. The HSA then conducted door-to-door follow-ups with each household to assess their progress. Out of the 33 households visited by the HSA in one morning, 17 had installed both drop hole covers and hand-washing facilities, one had installed a hand-washing facility without a drop-hole cover, and the remaining 14 had installed neither. The HSA recorded the figures so she could follow-up at the end of the week (four days later). If the households fail to make the needed improvements, the village headmen can issue fines to uphold community bylaws requiring all households to have proper toilet facilities.

Figure 10.6: Drop-hole cover over the opening of a pit latrine, Luhimbo 2

Photo credit: Author (2017), with permission

HSAs in Mwamatope and Mwanyesha used the opportunity when following-up to test for malnutrition in children five years and under. Because women are typically responsible for care work, their children were usually either tied to their back or playing in and around the home when the HSA arrived. The HSAs used a measuring tape to determine the circumference of the child's upper arm. Three colour codes were imprinted on the measuring tape: red indicated that the child was wasting and required urgent medical attention at the hospital; yellow indicated that the child should be entered into a feeding programme; and green indicated the child was well-nourished. Because most HSAs are women and because most household members who are home during the day are also women, they have developed close relationships with mothers and their children (most of whom they know on a first name basis) and are thus acutely aware of their needs.

Disease surveillance and contagion control

Community outreach was central to the hospital's response to the cholera outbreak during the 2016 rainy season. The HSAs formed blocks in affected villages to conduct door-to-door campaigns aimed at explaining how cholera is spread and how it can be prevented through safe WASH (particularly proper hand-washing), distributing chlorine tablets to households who rely on water from unsafe sources (particularly the lake), monitoring the spread of the outbreak, and referring individuals displaying symptoms (extremely watery diarrhoea) to the hospital, where a temporary quarantine facility in a tent had been erected. To contain the outbreak, the campaigns primarily involve water treatment and hygiene promotion.

10.3.1 Links between the urban planning and public health systems

The vital link that HSAs provide between communities and the public health system combined with their experiential knowledge of environmental health (particularly among women and children) position them as key public health stakeholders. At the same time, the vital role that VHCs play as community structures for preventative health position them as key nodes within emerging horizontal governance networks at the village level.

Ultimately, however, HSAs and VHCs have minimal influence on improving the quality of the physical environment given that their interventions are limited mainly to preventative health care, such as hygiene promotion. While these interventions are important, they do not address underlying risk factors linked to adequate provision of safe toilet facilities, piped water, drainage and solid waste collection, which are arguably more important to infectious and parasitic diseases in dense urban environments (see Hardoy et al. 2001).

Consequently, HSAs are forced into a situation of having to respond continuously to environmental health problems (including recurrent cholera outbreaks) because the underlying causes are beyond their capacity and remit to address. Indeed, that the hospital has put in place standardised procedures for containing and controlling the spread of cholera through hygiene messages and surveillance demonstrates not only an awareness of what the underlying risk factors are and where they tend to concentrate (along the lakeshore), but also an inability to address them through basic service provision. Cholera outbreaks have virtually become seasonal events and tend to affect the same villages continuously, highlighting neglected areas for WASH intervention.

Addressing WASH and other environmental risk factors requires the involvement of planning institutions mandated with improving the quality of the urban environment. However, the urban planning and public health systems operate at different scales, both far beyond that of Karonga Town. While Karonga District Hospital is located in the town, its catchment area encompasses a vast rural territory that extends all the way to the District's eastern boundary (Figure 10.7). Consequently, the hospital does not prioritise its services according to local health needs or collect health information that is specific to the town. Nor do HSAs coordinate their efforts at the town scale since their activities tend to be village specific, even though many environmental health hazards (floods, droughts, epidemics, earthquakes) affect the town as a whole.

Figure 10.7: Catchment areas for the Karonga District Hospital (Karonga Town's approximate location is indicated by the red arrow)

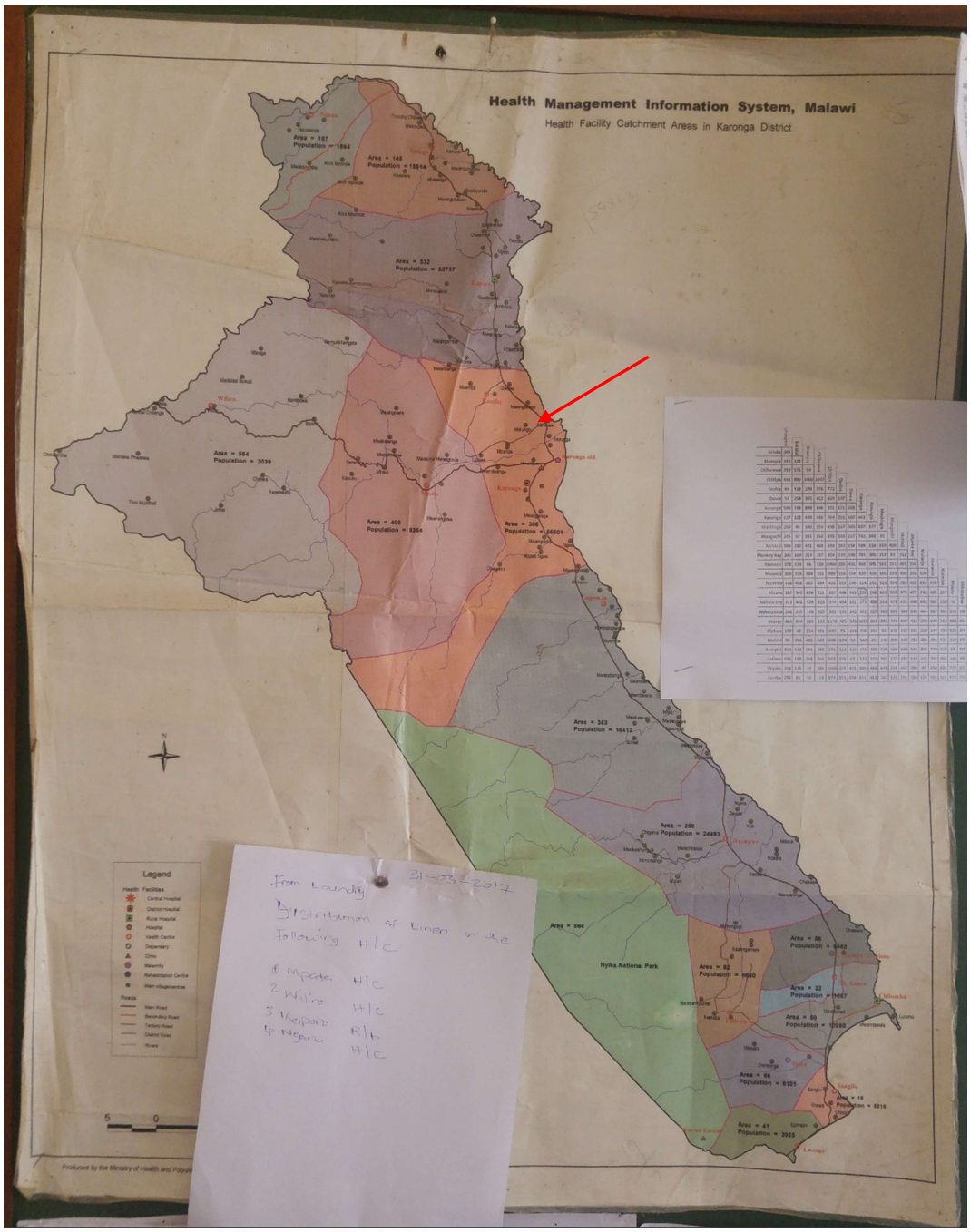


Photo credit: Author (2017), with permission

The urban planning and public health systems are thus disconnected institutionally and geographically. Both systems also lack the capacity to act proactively, demonstrated by the inability of the formal planning system to plan and manage the town's growth and by the

inability of the public health system to address risk factors for WASH-related diseases in particular localities.

10.4 Discussion

The evidence presented in Chapters Eight and Nine indicate that population health in Karonga Town is strongly influenced by the quality of the environment and the prevalence of environmental/disaster hazards—demonstrated by the incidence of infectious and parasitic diseases and injuries and the concentration of cholera cases in the most ill-served villages—and that the determinants of environmental health interact with one another at multiple, nested scales (individual, household, town-wide, regional). In this context, efforts to promote health require local institutional platforms that not only seek to improve the quality of the environment, but also to build partnerships between urban planning, public health and DRM stakeholders at the urban scale. Further research is required to test this hypothesis.

The NDRMCs can help to support these efforts given their focus on empowering communities to address environmental risk factors at the village, neighbourhood and town-scales in partnership with other stakeholders, including the District Council, NGOs and universities. The capacity of the NDRMCs has been strengthened by various research activities under Urban Africa Risk Knowledge (Urban ARK), including the research project ReMapRisk, as discussed above. The project was led by Mzuzu University in partnership with the Bartlett DPU to train NDRMC members—who include community members, chiefs, NGO staff, and District Council officials—to initiate strategic action planning processes that channel the information and learning from Urban ARK into local decision-making. The capacity building process was initiated through a series of workshops held in July 2017, each of which was observed. The strategic action planning process introduced during these workshops entails four stages and sets of corresponding questions (field notes, 2017):

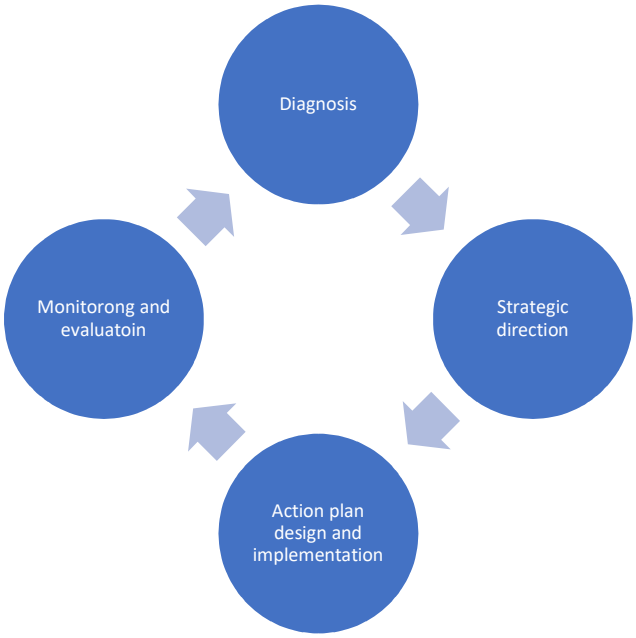
1. ***Diagnosis***
    - What are the priority risks to be tackled? Why?
    - How are these priority issues likely to change in the future?
    - Who is most vulnerable? Where?
    - Is more information needed? What specifically?
2. ***Strategic Direction***
    - What are the strategic targets that we want to achieve? (targeted/implementable/measurable/time-bound)
3. ***Action plan design and implementation***

- What actors/ initiatives are already being implemented? What are their weaknesses and shortfalls?

4. ***Monitoring and evaluation***
    - What are the baseline measurements from which we are starting from?
    - What indicators are we going to use to ensure we are meeting our strategic objectives?

The process is iterative; risk diagnosis and strategic directions are continuously refined in light of new information and continuous monitoring and evaluation (Figure 10.8). The products of the process are strategic action plans with seven characteristics: inclusive; well-informed; forward-looking; innovative; integrative; feasible/implementable; and sustainable.

Figure 10.8: Strategic action planning process



Source: ReMapRisk, Urban ARK (unpublished)

To develop a local information base on urban risk, ReMapRisk trained community members to map risks in each village using a participatory methodology composed of several stages. In the first stage, the local research partners were trained to use smart phones provided by the Bartlett DPU to map the boundaries of each of the town's 44 villages (in the old town boundary). Using a mobile application called Ramblr, the coordinates of the phone's locations and movements were recorded. The activity marked the first time that the villages' boundaries had been mapped in Karonga Town, providing a geographic basis for local planning and decision-making. The villages that comprise each of the town's four NDRMCs are illustrated in 8.3 above.

In the second stage, the research counterparts were trained to administer a digital questionnaire survey through focus group discussions with community members using a smart phone application called Survey123. The purpose of the survey was to assess three main dimensions of risk: exposure to risks (everyday, small and large) at the village level, vulnerability (quality of housing, type of services) and capacity to act. In the third stage, Survey123 was used to spatially analyse the results of the survey using ArcGIS through the generation of risk maps for each village.

In the fourth stage, a stakeholder workshop was held with chiefs on 27 July 2017 to share the maps and validate their information. A second workshop was held on the following day with members of each NDRMC to develop action plans with the support of the Urban ARK Research Counterparts (Figure 10.9). The NDRMCs were given two weeks to prepare their plans, all of which were delivered to the Urban ARK office on 11 August 2017. In the fifth stage, the plans were reviewed by researchers from Mzuzu University and the Bartlett DPU (myself included) to provide feedback. In the sixth stage, the strategic action plans were jump-started by a seed fund of MWK 900,000 (~£1,000) allocated to each NDRMC followed by a top-up fund to support the second stage of the process later on.

Figure 10.9: The strategic action planning process for Katolola 2

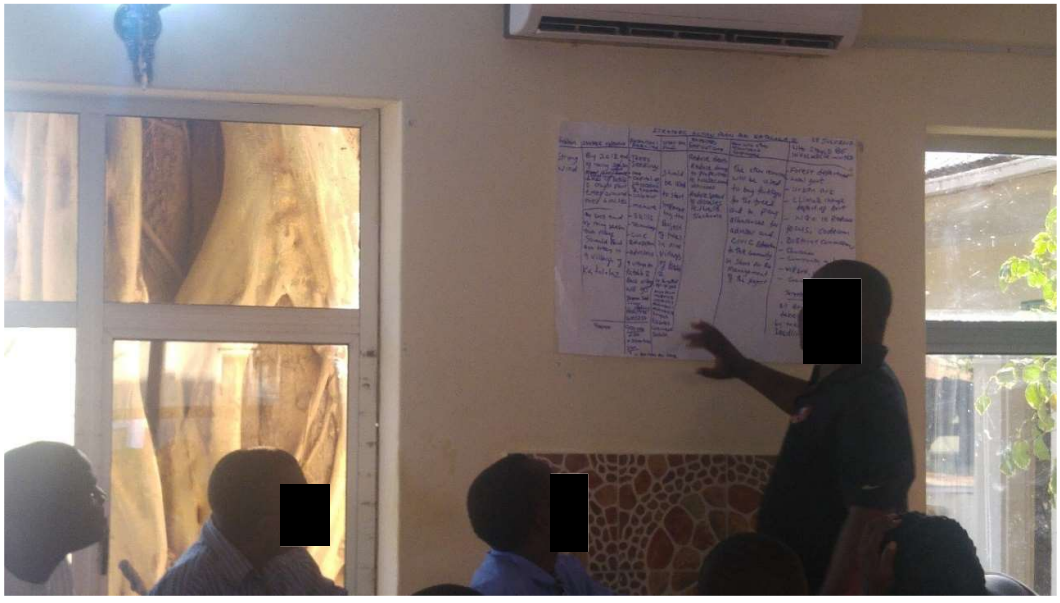


Photo credit: Author (2017)

Unfortunately, the strategic action planning process was initiated in the final stage of the field work, so it was not possible to observe their implementation or the allocation of the funds. Nonetheless, the prospects that strategic action planning presents for promoting a healthier and

more resilient town environment are potentially significant given its close links with aspects of complexity thinking, as identified by Glouberman et al. (2011) in Chapter Three (section 3.1.2):

- ***Gather local information**:* Local information is collected through participatory methodologies and then mapped to facilitate participatory planning processes.
- ***Respect history**:* The process is driven by people who understand the historical evolution of the town and its institutional structure.
- ***Consider interaction**:* The mapping of socio-economic and environmental risk factors at the village level permits an analysis of their interactions at different scales (village, neighbourhood and town-wide).
- ***Promote variation**:* The NDRMCs identify and prioritise localised interventions based on the risks unique to each neighbourhood, thus differentiating the process from comprehensive approaches that support 'one-size-fits-all' solutions.
- ***Conduct selection**:* Localised interventions undergo a process of selection through a continuous process of diagnosing the problem, identifying solutions, and monitoring and evaluating their success.
- ***Fine-tune processes**:* Localised interventions are continuously refined through the strategic action planning process, allowing changes in the urban system to be considered.
- ***Encourage self-organisation**:* NDRMCs have emerged in the absence of sufficient formal support at the local level and are led by communities who are among the most under-served and at risk, demonstrating the self-organising capacity of civil society.

Strategic action planning has its origins in the DPU planning tradition developed by Koeingsberger (1982), representing what Watson (2009) identifies as a 'counter culture' in urban planning that argues for a stronger role for civil society and more flexible and strategic planning actions that are more responsive to urban change than conventional master plans, particularly in situations where strong and accountable local governments are lacking.

There are limits to what NDRMCs can achieve, however. NDRMCs are well placed to support micro-projects aimed at enhancing access to basic risk-reducing infrastructure and services (communal water points, toilet facilities, community drainage), local development projects (agriculture, health, livelihoods) and post-disaster relief by working in partnership with other stakeholders (NGOs, HSAs, District Officials, chiefs), but they cannot fulfil planning functions linked to land management, the enforcement of regulatory frameworks, and the provision of

trunk and hazard mitigating infrastructures, all of which should be the responsibility of local government.

In addition, chiefs were observed as among the dominant participants of the first strategic action planning processes at the village level, calling into question the extent to which these processes are inclusive of all community members, particularly women and children (field notes, 2017). Additional field research on other strategic action planning processes would be required to validate this initial observation, however. The role of chiefs in the NDRMCs nevertheless re-affirms their influence over decision-making at the village level, positioning them as key stakeholders in local planning processes.

Thus, while NDRMCs have the potential to achieve some degree of improvement in the local environment, they do not represent a sustainable nor entirely democratic solution in the long-term, particularly as Karonga Town continues to rapidly grow and expand. If a Town Council were to be reinstated, the NDRMCs could help to mobilise stakeholders with the support of chiefs and Local Councillors, and so influence decision-making, planning processes and NGO projects. In the meantime, NDRMCs can be strengthened by creating synergies with HSAs and VHCs with the continued support of Mzuzu University and the Urban ARK Research counterparts. Doing so would create a link between NDRMCs and village-level structures that could work to integrate public health and DRM considerations into local planning processes.

10.5 Conclusion

Using the institutional lens outlined in Chapter Three (section 3.1.3) to understand the prospects for planning a healthier environment in Karonga Town has refocussed the discussion away from a primary focus on command-and-control capacity toward the enabling capacities required to support collective action in urban governance networks. This shift revealed major conflicts in urbanising rural territories where customary institutions struggling to maintain territorial control collide with formal institutions seeking to incorporate populations into planned townships in the absence of sufficient technical capacity and social legitimacy.

On the other hand, a focus on urban governance revealed nascent institutional structures that have emerged to reduce risk in the urban environment. Here, NDRMCs offer important prospects for planning environments that are both healthier and more resilient through strategic action planning processes, but their limitations must be acknowledged. Neighbourhood level committees comprised primarily of community members and leaders cannot be expected to replace the formal planning system or fund and construct the trunk

infrastructure required to remove environmental hazards at the neighbourhood and town-wide scales. Nor are NDRMCs continuous, self-sustaining institutions, but are largely confined to project life-cycles dependent on external funding.

Ultimately, fulfilling these functions requires a Town Council. Until one is reinstated, however, it is difficult to envisage a way forward for planning healthy urban environments. While this is a frustrating conclusion for urban researchers seeking to inform urban practice, it highlights the enduring importance of local governance as a fundamental precondition for urban planning and the disadvantages often faced by smaller urban centres in this regard. The conflicts between customary and formal institutions nevertheless provide new theoretical and practical insights into the nature of urban planning in places such as Karonga Town, highlighting the utility of the institutional lens used to guide the analysis in this Chapter. These insights are elaborated in the following Chapter (section 11.4.1).

Chapter 11 Discussion and conclusions

As stated in Chapter One (section 1.3), this study addressed the following research question and objectives:

- How is in situ urbanisation influencing the nature and scale of environmental health risks and outcomes in emerging African towns and their prospects for planning healthy urban environments?
    - Research objective 1: To test the hypothesis that smaller urban centres comprise a large and typically growing share of the urban population through an analysis of census data in Malawi
    - Research objective 2: To test the hypothesis that environmental health may be especially poor in smaller urban centres through an analysis of the 2010 Malawi Demographic and Health Survey (DHS)
    - Research objective 3: To document environmental health outcomes and their socio-spatial distribution in Karonga Town through an analysis of hospital records
    - Research objective 4: To understand the multiplicity of interacting determinants of environmental health in Karonga Town
    - Research objective 5: To understand the prospects for planning a healthy environment in Karonga Town through an analysis of the evolving institutional context in which its urban planning system is embedded

Addressing the research question and objectives required an interdisciplinary approach that incorporated perspectives from demography, ecology, urban risk, urban planning and development, and public health set in the context of African area studies. In bringing these perspectives together in the narrative constructed in Chapter Two (section 2.1), the study explored the importance of smaller settlements to Africa's late urban transition, the processes of in situ urbanisation that are transforming urban environments and rural governance regimes at the bottom of the urban hierarchy, and the prospects for planning healthy urban environments in emergent African towns based on the case of Malawi, with specific reference to Karonga Town.

The study differentiates itself from other accounts of Africa's urban transition that have focused on the causes and patterns of urbanisation (for example, Fox 2012; Potts 2012; Satterthwaite 2016a) and peri-urbanisation (for example, Simon et al. 2004; McGregor et al. 2006), as

reviewed in Chapter Two (section 2.1.1), by providing initial insight into the *placed-based dynamics of African urban emergence from the bottom-up*. These dynamics are of growing importance in sub-Saharan Africa given its relatively low urbanisation level, meaning that many urban settlements have yet to emerge. As the process unfolds, rural villages will grow into towns, towns will be statistically reclassified as urban (thus raising the urbanisation level), and modern institutions will attempt to intervene in existing rural governance regimes that may be resistant to change. The case of Karonga Town reveals the challenges this process presents for efforts to plan and manage the growth of settlements once they have already emerged, and the consequences for the urban environment and related health risks and outcomes.

The study breaks new ground empirically by providing what I believe to be the most detailed information to date on the highly local dynamics of situ urbanisation and their consequences for environmental health and rural governance in emerging African towns, conceptually by contributing to existing and new theories of urban planning and governance in these contexts, and practically by generating insights for local stakeholders engaged in urban planning, public health and disaster risk reduction (DRR) in Karonga Town and at higher levels. It is anticipated that the findings will be of relevance to surrounding countries facing similar demographic, environmental and institutional challenges.

This Chapter is comprised of six sections. The first section synthesises the major findings and their contribution to existing knowledge on the demographic importance of smaller African urban centres, their environmental health situations, and their prospects for planning healthy urban environments based on this particular case. The second section presents the study's major contributions to initial theories of urban planning and governance in smaller African towns. Sections three and four identify the implications of the findings for future research and practice, respectively. The fifth section reflects on the utility of the analytical framework, as developed in Chapter Three, and identifies the empirical, theoretical and practical insights it was able to elucidate. The final section concludes by reflecting back on how much is now known about smaller African towns, and where researchers and practitioners need to go from here.

11.1 Major findings

11.1.1 The demographic importance of smaller Malawian towns

Satterthwaite's (2016a, 2017) research under the Urban Africa Risk Knowledge (Urban ARK) research project highlighted the demographic importance of small and intermediate urban centres in sub-Saharan Africa's urban transition, the governance crisis that many are facing

without local capacities to plan and manage urban change, and the resulting risks faced by their populations. His work builds on an established body of literature that has sought to shift the debate in the urban studies beyond the prevailing focus on the largest cities by highlighting the position of small African towns in national urban systems, the roles that many play in rural and regional development, and the growing concern for local environmental hazards that threaten their growth and development potential (Rondinelli and Ruddle 1978; Hardoy and Satterthwaite 1986; Baker 1990; Baker and Pedersen 1992; Baker and Claeson 1997; Pedersen 1997; Satterthwaite and Tacoli 2003; Montgomery et al. 2004; Champion and Hugo 2004; Satterthwaite 2006).

Unfortunately, Urban ARK's sample included only one small settlement, Karonga Town, as discussed in Chapter One (section 1.2). While the project provided detailed empirical insights into the nature and scale of urban risk in the town (this study and others; see Manda 2013, 2014; Manda et al. 2016; Manda and Wanda 2017), it is unclear how broadly these insights may apply to the thousands of other smaller urban centres that are reported to be rapidly growing with limited capacities to manage urban change in the region (Satterthwaite 2017; see also Birkmann et al. 2016; Dodman et al. 2009; Hardoy et al. 2001; Hewett and Montgomery 2001; Satterthwaite and Tacoli 2003; UN-Habitat 2006). This is partly why this study identifies hypotheses (presented below) from the main findings so they can be tested in similar cases with the intention of further developing detailed empirical insights rather than simplistic generalisations, as discussed in Chapter Three (section 3.1) and Chapter Four (section 4.3). The analytical framework introduced in Chapter Three is intended to guide future research to that end.

The findings build on Satterthwaite (2016a, 2017) by providing new empirical insight into the demographic importance of small and intermediate urban centres in sub-Saharan Africa based on the analysis of the 2008 Malawi census in Chapter Six (section 6.3). Key findings are as follows:

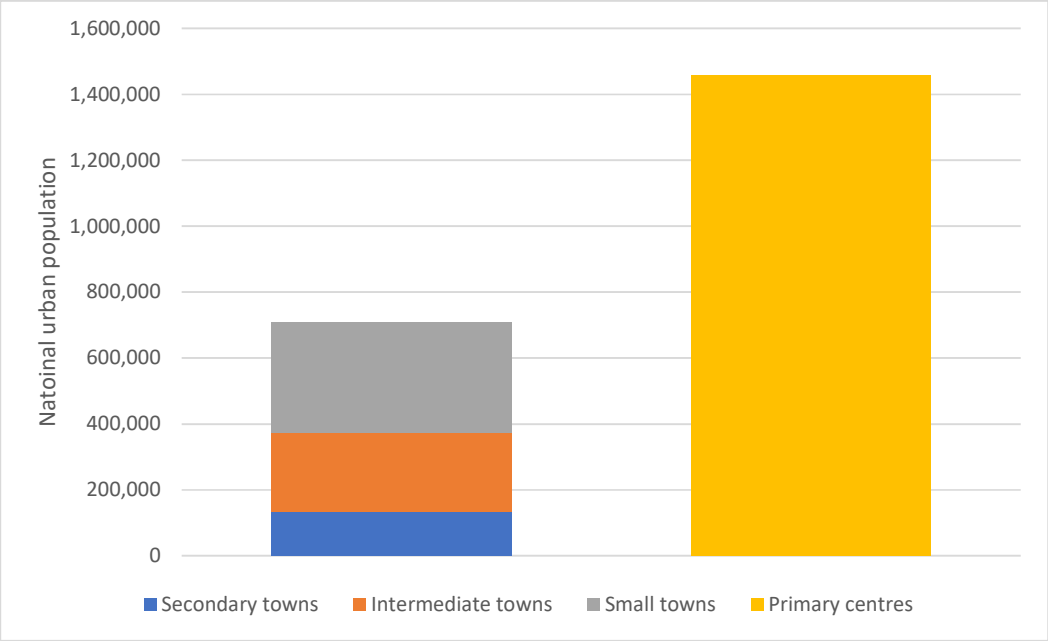
Smaller Malawian towns are more demographically important than previously thought

The study's first objective was to test the hypothesis that settlements at the bottom of the urban hierarchy comprise a large and typically growing share of urban growth through an analysis of census data (NSO n.d.). The findings partially support this hypothesis in relation to the share of Malawi's urban population living in smaller centres. Census reports generally use the categories of the four largest cities (Lilongwe, Blantyre, Zomba and Mzuzu) and 'other cities' to assess the

spatial distribution of the urban population. According to these criteria, 78% of the national population lived in the four largest cities in 2008 (NSO n.d.).

The new estimates presented in this study indicate that 71% of the national population lives in the four largest cities. The decrease is attributed to the inclusion of 15 rural market centres with populations greater than 5,000 that the National Statistical Office (NSO) defined as rural. The share drops to 67% if Zomba is defined as a secondary town. If so, the share of the urban population living in smaller urban centres increases from 29% to 33%, with most of their populations living in 30 small towns accounting for 15% of the total urban population followed by nine intermediate towns and two secondary towns accounting for 11% and 6% of the total urban population, respectively (Figure 11.1).

Figure 11.1: New estimates for urban size distributions in Malawi, 2008



Data from: NSO (n.d.), combined and presented by author

The findings demonstrate that smaller urban centres are more demographically important than previously thought and that the national policy of decentralised urbanisation under the National Physical Development Plan (NPDP) was more successful than recent evaluations indicate (see Manda 2013), as discussed in Chapter Six (section 6.3). Ensuring that Malawi's urban transition contributes to healthy urban environments will therefore depend substantially on how the process is planned and managed outside the four largest cities, reinforcing the need for census data that are disaggregated for individual urban centres and for statistical frameworks that are more representative of urban size distributions. The adoption of the four tier settlement

hierarchy by Manda (2013) used in this analysis and subsequently adopted by the Physical Planning Department and the NSO presents an important opportunity to use the 2018 census for both urban statistical and planning purposes, as discussed below.

The contribution of smaller urban centres to urban growth should not be over-stated or under-stated

The findings are less supportive of the hypothesis that smaller urban centres account for a growing share of the national urban population. Population figures for 15 small towns were not available for the intercensal period between 1987 and 2008, meaning their contribution to total urban growth during this period is under-estimated. Many smaller urban centres were nonetheless among both the fastest growing (six of the top-ten fastest growing urban centres were small towns) and slowest growing (revisit Table 6.5).

Overall, the contribution of urban centres with populations less than the four largest cities to total urban growth was minimal: primary centres accounted for the majority of total urban growth during the intercensal period at 76% followed by intermediate towns at 9%, small towns at 8% (likely under-estimated for the reasons above) and secondary towns at 7%. This finding reflects the fact that the annual urban population increment is more important than the rate of urban growth. In other words, even though smaller urban centres may be among the fastest growing, their small population sizes mean that their annual population increments will be less than the largest cities, assuming the latter are growing, as discussed in Chapter Two (section 2.1.2).

This finding is important because it questions popular claims that smaller urban centres are driving rapid urban growth when their contribution is actually relatively small in countries where a large share of the urban population lives in one or two large cities that are continuing to grow. The demographic importance of smaller urban centres should therefore neither be over-stated in situations where the annual population increment of the largest cities is significantly greater than that of their smaller counterparts or under-stated in situations where data for all urban centres are lacking and where statistical frameworks under-represent the population at the lower end of the urban hierarchy.

The case of Malawi supports the suspicion that the share of the urban population in smaller African towns is under-estimated

Satterthwaite (2016a) provided initial insight into the share of the urban population in sub-Saharan Africa living in smaller urban centres through an analysis of available census data. This

was a challenging task given the lack of reliable and up-to-date census data in many countries in the region combined with the different criteria many use to distinguish the lower threshold (when a rural settlement becomes an urban settlement) and upper threshold (when an urban centre becomes too large to be considered small) (see Pedersen 1997: 19), as discussed in Chapter Two (section 2.1.2). To avoid as much ambiguity as possible, Satterthwaite (2016a) drew on census data from a combination of sources (including www.citypopulation.de/, various government websites and from the most recent 2014 United Nations *World Urbanization Prospects*) to categorise urban centres by population size. The key finding that between 20% and 40% of the region's urban population is likely to live in smaller urban centres (with less than 500,000 inhabitants) was discussed in Chapter Two (section 2.1.2).

The limitations of relying on census data for individual countries with varying definitional criteria is evident in the 2008 census data for Malawi compiled by Satterthwaite. The data indicate that Malawi had 14 urban centres with less than 20,000 inhabitants, 10 with between 20,000 and 49,999 inhabitants, 2 with between 50,000-199,999 inhabitants, none with between 200,000 and 499,999 inhabitants, 2 with between 500,000 and 1.9 million inhabitants, and none with larger populations, amounting to a total of 28 urban centres. In contrast, this study identified 44 urban centres in Malawi in 2008, including 20 urban centres with between 5,000 and 19,999 inhabitants, 9 with between 20,000 and 49,999, 2 with between 50,000 and 99,999, and 3 with 100,000 inhabitants or more.

That a larger number of smaller urban centres exist in Malawi and that they accommodate a larger share of the urban population than current census reports (NSO 2008) indicate supports Satterthwaite's (2016a) suspicion that the share of the urban population they accommodate is under-estimated. In order to permit more detailed analyses of urban size distributions, future census reports for Malawi should provide complete coverage of urban centres of different sizes using the four tier settlement hierarchy. Doing so would help to better understand how the in situ growth of settlements at the bottom of the urban hierarchy is influencing Malawi's urban transition. Practical insights for the processing and reporting of the 2018 census are presented below.

Intermediate centres are increasing in relative importance as their number and size continues to grow

In 2008, there were nine intermediate towns in Malawi, which together accounted for 11% of the national urban population in that year and 9% of total urban population growth between 1987 and 2008. By 2018, it is expected that 8 additional intermediate towns (Thyolo, Rumphi,

Mchinji, Mponela, Chitpa, Ntcheu, Mulanje and Mwanza) will emerge given their size and growth rates.

By 2022, Karonga Town's population is estimated to reach 70,460, up from 41,074 in 2008 (Ministry of Lands and Housing 2013). By that time, Karonga Town together with Kasungu are expected to join Mangochi as secondary towns, while Zomba is expected to become a primary centre. These trends indicate that urban size distributions are becoming more evenly balanced as small towns become intermediate and secondary towns, potentially leading to reductions in the primacy of the largest cities (particularly Lilongwe and Blantyre). The extent to which these trends continue, however, may depend increasingly on whether the growth of small towns is planned and managed in a way that is conducive to population health, in-migration, and the expansion of non-farm economic activities.

The experience of Karonga Town reinforces the concerns voiced by development scholars (Christiaensen et al. 2013; Christiaensen and Todo 2013; Satterthwaite and Tacoli 2003; Proctor 2014; Satterthwaite 2017) who highlight the potential of smaller centres to contribute to livelihood diversification, as documented in Ghana (Knudsen and Agergaard 2015), and the threats that deteriorating urban environmental conditions present for their development, as discussed in Chapter Two (section 2.1.3). The consequences for the North as Malawi's least urbanised and developed region may be significant if Karonga Town fails to realise its socio-economic potential as a major trading centre. If so, the town's contribution to rural transformation may be minimised.

11.1.2 The environmental health situation in smaller Malawian towns

Several key findings stand out from the analysis of the 2010 Malawi DHS in Chapter Seven (section 7.5) and the analysis of hospital records in Chapter Eight (section 8.2):

Levels of basic service provision decline the smaller the urban size

The study's second and third objectives were to test the hypothesis that environmental health may be especially poor in smaller urban centres through a quantitative analysis of the 2010 Malawi DHS, archival research of hospital records, and ethnographic research of local determinants. The findings of the DHS partially support this hypothesis based on the indicators used to estimate access to piped water, flush toilets and electricity. However, the accuracy of these indicators may have been compromised by a number of limitations—in particular, non-representative sample sizes and misclassification errors—stemming in large part from analysing

a national sample survey at the sub-national scale, meaning the sample may not be locally representative, as discussed in Chapter Seven (section **Error! Reference source not found.**).

The findings therefore provide a partial picture of the environmental health situation at different levels of the urban hierarchy and require further validation. The findings nevertheless correspond with previous analyses of DHS data by Hewett and Montgomery (2001) indicating that levels of provision of piped water in the home, flush toilets and electricity tend to decline the smaller the urban size, with the smallest urban centres being the most ill-served (see also Montgomery et al. 2004). The data also revealed variations between urban centres of similar sizes, with small towns ranking both among the worst and to a lesser extent best served. It is likely that small towns with the lowest rankings offset the reportedly high levels of provision among the highest ranked. This finding reflects Hardoy and Satterthwaite's (1986) observation that urban conditions vary widely in smaller centres, rendering generalisations and universal prescriptions problematic, as discussed in Chapter Two (section 2.1.3).

Lower levels of basic service provision in smaller Malawian towns does not necessarily correlate with higher incidence of related environmental health outcomes

It was expected that lower levels of provision of piped water, flush toilets and electricity in smaller urban centres would correlate with higher incidences of related illnesses measured in terms of diarrhoea among children (under the age of five years) and under-five mortality rates. The under-five mortality rates increased the larger the urban size, with secondary towns and primary centres having the highest rates at 148 and 94, followed by intermediate towns and small towns at 82 and 70.

The estimates for diarrhoea prevalence displayed a similar, though less dramatic, pattern: 20% of children in primary centres had diarrhoea in the two weeks preceding the survey, followed by secondary towns at 18%, intermediate towns at 17% and small towns at 15%. These findings indicate that lower levels of provision of piped water, flush toilets and electricity connections in smaller urban centres does not necessarily correlate with higher incidence of related health outcomes, even though these services are known determinants of diarrhoea and other environmental causes of infant mortality (see Prüss-Üstün and Corvalán 2006).

This discrepancy suggests that other potentially more significant environmental determinants may be at play. For instance, density and overcrowding tend to be higher in larger than in smaller urban centres and compound unsanitary conditions where service provision is poor, as in many informal settlements (Hardoy et al. 2001). However, many villages in Karonga Town, such as

Malema 2 and Mwafilaso, are densifying in the face of growing population and land pressures, as discussed in Chapter Nine (section 9.1.4), suggesting that the town's environmental conditions are worsening and possibly becoming similar to those of larger urban centres as urban growth continues to be poorly planned and managed. The hypothesis that environmental health may be worse in smaller urban centres thus needs to consider a broader range of environmental hazards (such as density/overcrowding, water quality) beyond access to basic services (such as access to piped water, flush toilets and electricity connections). This conclusion highlights the need to examine the different determinants of environmental health in a more holistic manner (they do not operate in isolation), as argued in Chapter Two (section 2.1.2).

The case of Karonga Town indicates that health in smaller Malawian towns may be strongly linked to environmental hazards

The analysis of hospital records in Karonga Town supports the hypothesis that health outcomes may be strongly linked to environmental hazards in smaller African towns. Unexpectedly strong links between the environment and health were observed in the urban inpatient population:

- 63% of all reported diseases and health conditions during the study period (between August 2016 and July 2017) were attributable to environmental causes (termed environmental health problems);
- environmental health problems were dominated by infectious and parasitic diseases at 64%;
- malaria, acute respiratory infections, malnutrition, injuries and diarrhoeal disease accounted for 93% of all cases;
- infants and children 5 years and under were disproportionately affected by these and other environmental health problems;
- the rainy season accounted for the largest share of environmental health problems, in particular diarrhoea disease at 68% and malaria at 48%; and
- recent cholera outbreaks have disproportionately affected the lakeshore area where water and sanitation is especially poor.

That environmental hazards may be responsible for a large share of diseases and health conditions in the town contrasts with the findings of the DHS indicating that environmental hazards may be less significant in smaller than in larger urban centres (based on the indicators for diarrhoeal prevalence among children under the age of five years and under-five mortality rates). Without disease surveillance systems for individual urban centres, it is difficult to draw

conclusions concerning the environmental health situation at different levels of the urban hierarchy.

Environmental health outcomes in Karonga Town are unevenly distributed by age and sex and may be influenced by structural transformation

It was expected that environmental health outcomes would be biased toward women given the health impacts commonly associated with the gendered division of household labour, as discussed in Chapter Two (section 2.1.4). However, men accounted for nearly 60% of all acute respiratory infections and more than 70% of all injuries. This observation could signify the heightening exposure of men to occupational hazards due their high levels of participation in manual labour, including small-scale industrial activities and bicycle taxi services. The involvement of men in manual labour may increase their exposure to particulates in the air and accidental injury. Structural transformation could subsequently lead to changes in the distribution of occupational hazards towards men, but more detailed studies would be required to test this hypothesis.

The findings nevertheless provide an initial indication of how the characteristics of people based on their social identity and status may be interacting with processes of in situ urban change to (re)shape the social distribution of environmental health risks and outcomes. While this observation is tentative, it builds on desk-based studies by Urban ARK scholars, such as Levy (2018), who argue for a better understanding of how structural inequalities are embedded in urban development pathways that produce health risks for particular groups of people based not only on their social identity, but also their living and working environments. The debate on urban health has seldom engaged with issues of gender (Frye et al. 2008), despite the highly gendered impacts of urban health risks, as discussed in Chapter Two (section 2.1.4) and Chapter Three (section 3.1.1). The experience of Karonga Town supports the integration of a gender perspective on urban change into the study's analytical framework in order to better understand the relationship between the social construction of urban health risks and urban development pathways.

Five environmental health problems were most prevalent in all villages in Karonga Town, suggesting that certain determinants may be of heightened importance

Cases of cholera were concentrated in villages with the poorest provision of water and sanitation. Conversely, the top-five environmental health problems—malaria, acute respiratory infections, malnutrition, unintentional injuries and diarrhoea—were distributed evenly across

the town. This observation indicates that certain environmental determinants may be common to most villages and be of heightened importance for health. The findings also indicate that cholera burdens may be relatively small given that the outbreak observed during the 2016 rainy season accounted for a fraction of all environmental morbidity and mortality at 3% and 4%, respectively, during the study period (August 2016 to July 2017). While no other large-scale events were observed, except for several seasonal floods, which were highly localised and difficult to pinpoint, it was not possible to judge the relative importance of environmental hazards of different sizes and frequencies for health. The difficulty of determining the location of small-scale events reaffirms the need for databases on loss and damage at the urban scale in order to capture those events occurring in small area units, such as neighbourhoods and blocks (Vlahov et al. 2011; Osuteye et al. 2017; Satterthwaite et al. 2018b), as discussed in Chapter Two (section 2.1.4).

The findings nevertheless substantiate the importance of everyday hazards for health given the prevalence of diseases and health conditions associated with infectious and parasitic diseases and accidental injuries, providing further evidence to support the claim in the literature on urban risk that everyday hazards account for the majority of ill-health, injury and pre-mature death in African towns and cities (Bull-Kamanga et al. 2003; Pelling and Wisner 2009; Mitlin and Satterthwaite 2013; Adelekan et al. 2015; Brown et al. 2017), as discussed in Chapter One (section 1.1.1).

Environmental health in Karonga Town is unequally distributed socially and spatially depending on multiple inter-related determinants

The ethnographic research uncovered the importance of numerous inter-related determinants of environmental health linked to the prevalence of physical hazards, density and overcrowding, varied living and working conditions, conflicts between stakeholders, institutional capacity challenges, and development projects that are contributing to environmental hazards, as discussed throughout Chapter Nine. The complexity of determinants at play and their highly inter-connected nature indicates that environmental health and its determinants are highly contingent on local conditions, as exemplified by the challenge of improving sanitation facilities in villages that are dense, flood-prone, resource constrained, and constructed on sandy soils and in protected areas (drainage channels, flood plains). This example underscores the need to avoid one-size-fits-all approaches in favour of more holistic ones that are sensitive to local needs and changing circumstances.

11.1.3 Prospects for planning a healthy environment in Karonga Town

Ethnographic research of Karonga Town's planning system was undertaken to explore the prospects for planning a healthier urban environment using the analytical lens developed in Chapter Three (section 3.1.3). This exploration enabled an historical analysis of how the institutional context in which urban planning is embedded has evolved as the process of in situ urban change has unfolded. The findings above demonstrating the prevalence of environmental hazards in the town indicate that existing institutional arrangements are not leading to healthy environments or the planning systems required to achieve them. They are rather leading to environments that are increasingly unhealthy and risk-prone, manifested by the prevalence of infectious and parasitic diseases, physical hazards (notably seasonal floods) and cholera outbreaks. Karonga Town's planning system is therefore seen as neither healthy nor resilient. Four findings shed light on the prospects for planning healthier environments in this context:

Karonga Town's planning prospects are historically contingent

Manda (2013) assessed the challenges facing the town's formal planning system and attributed the lack of institutional capacity as the cause of most planning failure to the dissolution of the Town Council in 2005, as discussed in Chapter Five (section 5.2.5). Building on Manda, the findings suggest that the town's planning prospects are not only linked to recent governance reforms, but also to its history as an urbanising centre in a traditionally rural territory. Karonga Town's in situ growth was triggered by its favourable climate and emerging importance as a local trading post and British Overseas Military Area (BOMA) and by ensuing infrastructural developments, as discussed in Chapter Five (section 5.2.1). By 1987, its population had reached 19,630, up from 11,242 in 1966 (Ministry of Lands and Housing 2013).

The town's growth did not attract the attention of planners until 1986, when its first major plan was prepared. Thus, by the time planning "found the town", as one physical planner remarked (field notes, 2017), it was already an emerging urban centre governed by an existing rural governance structure, as discussed in Chapter Ten (section 10.1). Until then, most, if not all, land in the town would have been allocated by chiefs through customary channels. The declaration of Karonga Town as a Statutory Planning Area in 1991 subsequently made the formal planning system legally responsible for land management, creating tensions and conflicts between customary institutions following traditional rules and norms, and formal government institutions following official rules and regulations. Conflicts have become increasingly entrenched as the process has unfolded, highlighting the need to understand planning as a

historically contingent practice influenced by evolving social norms and relations linked to ongoing processes of in situ urban change.

Karonga Town's planning prospects are constrained by a rural governance structure

When the Town Council was dissolved in 2005, the urban governance structure was effectively re-ruralised, creating a vacuum for chiefs to consolidate their control over land and hence society and governance. Today, chiefs arguably have more influence over local decision-making—particularly at the Village Development Committee (VDC) level—than their elected counterparts. At the same time, the District Council has lost much of its social legitimacy due its inability to provide basic services and prevent disasters through urban planning, as demonstrated by the refusal of market vendors and shopkeepers to pay fees following seasonal flooding, as documented in Chapter Nine (section 9.1.7). Projects approved by the District Council in protected areas, as in the primary school constructed in the flood plain, demonstrate the willingness of decision-makers to disregard planning regulations at the behest of chiefs, as documented in Chapter Five (section 5.2.1).

In other cases, District Councillors have bypassed the planning system for economic and political considerations, as in the case of the Water Treatment Plant and the market stall expansion project. In the absence of a Town Council and a regular Town Planning Committee, the checks and balances to ensure that decision-makers follow regulations are simply not in place. It is thus difficult to accept District Officials who blame planning failure on 'native' populations who do not follow standards when they do not follow them either.

In this context, the codification of the formal planning system has not resulted in planned (formal) urban development in much the same way that the weak institutionalisation of the local state has not resulted in the shift of power from traditional to modern institutions. In contrast, Karonga Town's governance arrangement has hybridised with the increasing involvement of chiefs in local-level decision-making processes, particularly at the VDC level, reinforcing their roles as community representatives and gatekeepers for NGO and donor projects and as *de facto* public servants.

Whether the authority of the state should be accepted has yet to be resolved, as demonstrated by one high-ranking chief who views the District Council as beneath his authority. Consequently, the distance between the formal planning system and the people it is meant to control (and serve) has widened, while the conflicts between them have become increasingly entrenched. This gap has resulted in the shift in the balance of power away from elected leaders and officials

toward chiefs, even though they are neither elected nor necessarily accountable, just or fair, as discussed in Chapter Ten (section 10.1.2). Yet the ambiguity between chiefs' *de jure* and *de facto* authority, as demonstrated by the contradictions between the *Chiefs Act* and the *Town and County Planning Act*, makes it difficult to determine the role they should play in urban planning and development, as discussed in Chapter Five (section 5.2.5).

Karonga Town's planning prospects are strengthened by the Neighbourhood Disaster Risk Management Committees (NDRMCs), but they have limitations

In the absence of a Town Council, it is difficult to envisage a way forward for planning a healthier environment. NDRMCs provide an opportunity to mobilise stakeholders (formal and customary) since they were established to address environmental risks at the neighbourhood scale and recently trained by researchers to identify, plan and implement local projects using the strategic action planning approach outlined in Chapter Ten (section 10.3). This approach embodies many aspects of complexity thinking, as outlined in Chapter Three (section 3.1.2), including a focus on local projects; engaging multiple stakeholders; gathering and using local information; integrating inter-linked planning issues (in this case, DRM and public health); social learning through continuous monitoring and evaluation; identifying lessons learnt; and working at the urban scale. In this way, NDRMCs are well placed to address the interactions between the many determinants of environmental health identified in Chapter Nine (section 9.2).

There are limits to what NDRMCs can achieve, however. While they can support local projects to enhance access to basic services (water connections, toilet facilities, community drainage, irrigation) and post-disaster relief, they are project-based and so rely on external funding and are unsustainable. Nor can they engage in land management, adopt and enforce regulatory frameworks, or provide the trunk infrastructure needed to reduce flooding and waterlogging and dispose of liquid and solid waste. Fulfilling these functions would require the reinstatement of a Town Council with a strong planning department and responsive regulatory framework. But even if one were reinstated, it remains unclear whether existing tensions and conflicts between customary and formal institutions would be resolved so long as the rationalities between them continue to clash, particularly if District Council seeks to enforce compliance, which, according to the Director of Planning and Development, would result in "war" with communities (Interview 17, 17 July 2017).

Karonga Town's planning prospects are influenced by processes of in situ urban change

Traditional social institutions have proven to be remarkably resilient in the face of urbanisation and continue to play important roles in land allocation, basic service provision (primarily through NGO and donor projects) and decision-making (primarily at the VDC level and to a lesser extent the NDRMC level), particularly in the absence of a Town Council. However, traditional social institutions could foreseeably break down if urbanisation leads to alternative land markets that serve private interests, as observed in Bwiba village, where the chief has begun to sell off land to private developers (Interview 7, 24 April 2017). If this occurs, chiefs' control over land could decline, leading to new state-society relations coalescing around land markets that may be equally problematic if they are also viewed by officials as 'informal' or 'illegal'.

While this is speculative, it is plausible given the experience of other Malawian urban centres where informal land markets have become the norm and where chiefs have been relegated to *ex officio* members of Local Councils (Ministry of Lands, Housing and Urban Development 2015), as discussed in Chapter Five (section 5.1.5). Similar trends have been observed in medium-size cities in Uganda (Kampala), Nigeria (Enugu), Lesotho (Maseru), Botswana (Gaberone) and Kenya (Eloret) (Rakodi 2006; Nkurunziza 2007). Rakodi (2006) concludes that:

> "informal land delivery processes are often both continuations of earlier land administration practices and also responses to the failure of formal systems, with which they have complex and contested relations. They deliver large volumes of land more successfully than formal systems, but the social institutions on which they rely are weakening in the face of urbanisation and commercialisation" (ibid: 263).

The commercialisation of customary land markets has potentially significant consequences for environmental health if these markets are either ignored or actively discouraged by officials through non-service provision or worse, eviction and clearance, assuming ample capacity. If this scenario were to play out in Karonga as an emerging secondary town, environmental conditions linked to poor planning and service provision could become similar to those of larger Malawian urban centres (see UN-Habitat 2010). Karonga Town's past as a rural and traditional settlement therefore has significant implications for its future as an emerging secondary town, underscoring the need for research approaches that are situated in time and place.

Karonga Town's planning prospects require an institutional design capable of managing a complex system, however small

The experience of Karonga Town challenges the view that the urban systems which constitute small towns are inherently less complex than those of metropolitan centres with larger scale populations and environmental hazards and more complicated bureaucracies. The complexity and dynamism of Karonga Town's system is heightened by the multiplicity of interacting health determinants documented in Chapter Nine, including its rapid urban growth from a low population base; exposure to a range of overlapping and mutually reinforcing environmental hazards (everyday, small and large); widespread housing and service deficits; a hybridised governance regime with no clear overarching authority; and mounting tensions and conflicts between existing customary institutions struggling to maintain territorial control and modern institutions seeking to incorporate the population into a planned township.

If the urban planning system is to engage effectively with the complexity of Karonga Town's system, however small, urban risk databases and health registers will need to collect demographic and health information to reveal the socio-spatial distribution of urban health outcomes and their determinants at the urban scale (for all villages); develop new analytical frameworks based on the kind of complexity thinking used here to examine the interactions between the multiplicity of health determinants (socio-economic, cultural, biophysical, institutional/political) in the urban environment; accommodate spaces in which competing stakeholders (modern and customary) can negotiate compromises that do not come at the expense of the urban planning system.

Therefore, the governance of Karonga Town's urban trajectory cannot simply be seen as a technical matter dependent on bureaucratic capacity, but as a political matter influenced by the dynamics of negotiation between competing stakeholders with rationalities that may either conflict or converge depending on the circumstances particular to individual development projects. This observation supports other scholars who argue that bureaucratic capacity in Malawi cannot be equated with state capacity in situations where the chieftaincy stands both in and outside formal state bureaucracy, constituting "a key component of state power and everyday governance" (Eggen 2011: 313).

The question that remains unanswered, however, is whether any future attempt to reinstate a Local Council in Karonga Town would reduce or intensify existing tensions and conflicts between chiefs and officials as two competing forms of local governance. While Eggen (2011) contends that the chieftaincy is unlikely to be replaced by formal government "in the foreseeable future"

(ibid: 313), the experience of Karonga Town suggests that in situ urban change will likely lead to the hybridisation of customary and modern institutions in the absence of a strong local state. In such situations, the prospects for urban planning and governance will likely depend both on historical factors linked to the existence of traditional rural governance regimes, which may be resistant to urban change, and contemporary factors linked to the rural penetration of modern institutions, which may lack the technical capacity and social legitimacy to take control. Whatever the case may be, the experience of Karonga Town suggests that the dynamics of local state building and governance is highly dependent on the evolving institutional and political conditions particular to emergent settlements, as discussed below.

11.2 Contributions to theory and theory-building

The study contributes to existing and new theories of urban planning and governance in smaller African towns.

11.2.1 Contributions to existing and new theories of urban planning and governance in small African towns

Theorising conflicting rationalities in small African towns

The study's first contribution to urban theory-building is to Watson's (2003) theory of conflicting rationalities, which emerged from a case study of an unplanned/informal settlement in Cape Town (South Africa) to illustrate the gap between the notion among officials that people should live in 'proper environments' and the survival strategies of the urban poor living informally.

The case of Karonga Town revealed a similar gap between District officials who believe that people should live in 'neat', 'organised' and 'coordinated' (read: planned) environments and chiefs who believe that people should live in the environments in which they have always lived in accordance with customary rules, norms and traditions. The nature of this gap in Karonga Town is not sufficiently explained by notions of informality, which Watson argues are central to conflicting rationalities in contested African settlements. The gap between people and planning is better explained by the emergence of efforts to codify a formal planning system in an urbanising rural territory in which chiefs, struggling to maintain territorial control, collide with officials seeking to incorporate urbanising populations into planned townships. In such cases, I proposes that conflicting rationalities are historically embedded in evolving social relations between traditional and modern governance institutions, and require alternative notions of informality as 'traditionality' to comprehend, as discussed in Chapter Ten (section 10.2). This

notion represents an effort to recognise the origins of traditional settlements governed by pre-existing customary social institutions and the changes to their regimes that are arising from processes of in situ urban change, the commercialisation of land markets, and the institutionalisation/de-institutionalisation of the local state.

Theorising converging rationalities in small African towns

The study's second contribution to urban theory-building marks a departure from Watson (2003) notion of conflicting rationalities discussed above. The case of Karonga Town demonstrates that the rationalities between formal and customary institutions do not always result in conflicts, but also in what I call 'moments of mutual accommodation'. One of these moments included the decision to approve and fund the primary school project in the flood plain, despite the provisions in the 2013 Urban Structure Plan requiring such areas to be protected. This decision demonstrated the trade-offs that officials are willing to make in order to provide public facilities to settlements that they do not fully approve of. This moment reflects what Lambert (unpublished) identifies as a 'convergence of rationalities', which provides a counterpoint to Watson (2003) by highlighting the dynamics of negotiation between institutions with rationalities that not only conflict, but also align in cases where interests are mutual. This insight represents a potentially fruitful area for future urban research and theory-building surrounding the politics of planning in contested Southern urban societies.

Alternative theories of planning failure in small African towns

The study's third contribution to urban theory-building is to the literature—however limited—on planning failure in African towns. Research by Yeboah and Shaw (2013) in Ghana, reviewed in Chapter Three (section 3.1.3), follows the tendency to blame a combination of weak (formal) institutional capacity and the practices of chiefs who continue to allocate land through customary channels in spite of official rules and regulations. The development projects reviewed in Chapter Five (section 5.2.1)—the primary school project, the market stall expansion and the water treatment plant—demonstrate that planning failure cannot be attributed solely to chiefs, but should also be ascribed to formal decision-makers who bypass the planning system for political and economic gain.

These projects, all of which evaded the regulatory framework, reflect Roy's (2005) notion of a 'state of exception': that which violates official rules and regulations, yet is allowed to exist. This observation suggests that understandings of planning failure in African towns must address a wider range of factors that transcend dichotomous notions of state institutions as wholly legal

and customary institutions as wholly illegal. Future research concerned with developing a theory of planning in African towns must view these and other institutions in a broader milieu to ensure that the social relations that influence decision-making in existing governance arrangements are not misrepresented or obscured. Understanding these arrangements could help to better understand the situated nature of rural governance regime change in smaller African towns.

Theorising the relationship between in situ urbanisation and rural governance regime change

The study's final contribution to urban theory-building is to the small, but growing body of literature on 'town chiefs' as a hybrid form of local governance (Cammack et al. 2009; Eggen 2011). Eggen (2011) theorises that the hybridised nature of local governance in Malawi stems from the 'penetration' of modern institutions into rural areas, thus challenging the urban/rural axis conventionally used to distinguish modern (urban) institutions from customary (rural) institutions, as per Mamdani's (1996) typology discussed in Chapter Five (section 5.1.5). While this theory describes rural governance regime change, it does not explain why modern institutions are penetrating peripheral locations in the first place.

The experience of Karonga Town provides such an explanation by revealing the relationship between in situ urbanisation and rural governance regime change. This relationship emerged following the declaration of Karonga Town as a Statutory Planning Area in 1991, by which time the town's population had already reached nearly 19,000, as discussed above. This change brought existing customary institutions seeking to maintain territorial control both into conflict and occasionally mutual agreement with modern institutions seeking to incorporate the population into a planned township. Several contextual factors influencing the relationship between in situ urbanisation and rural governance regime change emerge from the case of Karonga Town.

The first contextual factor concerns the nature of rural governance in less urbanised territories, where most chiefs are traditional hereditary chiefs recognised under the *Chiefs Act*. As Karonga Town grew from a rural village into a town, people gathered around hereditary chiefs, who have proven remarkably resilient to processes of in situ urban change and the subsequent emergence of modern institutions of urban planning in a traditional rural settlement. Thus, 'when planning found the town' as remarked by one planner quoted in Chapter 10 (section 10.1), planning also found hereditary chiefs. This situation contrasts from more established urban areas where different kinds of chiefs have emerged, including those who have assumed their positions through election or appointment, as Cammack et al. (2009) documented in other Malawian urban centres. Many hereditary chiefs in Karonga Town voiced an unwillingness to abandon

traditional social rules and norms in favour of modern alternatives they view as alien and/or as threats to their authority.

Chiefs' unwillingness to conform to modern institutions is especially strong when it comes to land, where much of their authority is vested, meaning that many would be unwilling to accept the *Town and Country Planning Act* since it does not recognise their authority over land. This tension was revealed by one chief who claimed that his village is located outside the town's official boundary, thus exempting his village from formal regulations, while simultaneously stating that his village is part of the traditional town, as discussed in Chapter Ten (section 10.2). In this context, the ability of modern systems of urban planning to effectively intervene depends in large part on whether rural governance regimes can maintain their authority and social legitimacy as they adapt to evolving urban conditions.

The second contextual factor concerns the ambiguity over chiefs' *de jure* and *de facto* authority over land in Karonga Town. While the *Chiefs Act* recognises chiefs' authority over land, the *Town and Country Planning Act* does not, as discussed above. It is thus unclear what role chiefs should play in land allocation and urban development more broadly. If a Town Council were to be reinstated under the *Local Government Act,* which requires Town Councils to be staffed with locally elected councillors, the role that chiefs currently play in local decision-making, particularly at the VDC level, could be reduced, especially if NGOs and donors opt to work more closely with the Town Council in project planning and implementation. However, given the role that chiefs continue to play as gatekeepers to communities, it is difficult to imagine how development projects–whether supported by the government, NGOs or donors–could proceed without their approval and involvement, especially if newly elected Local Councillors and newly appointed officials are viewed as socially illegitimate. What is clear is that until a Town Council is reinstated, chiefs will in all likelihood continue to be the most powerful actors in local governance.

The third contextual factor concerns the evolving nature of rural governance in emergent towns with weak or, in the case of Karonga Town, non-existent Town Councils. The 're-ruralisation' of the town's governance structure following the dissolution of its Council in 2005 created a vacuum in which chiefs reclaimed much of their authority over land and local decision-making. This situation is unusual not only given Karonga Town's size and growth, but also given its historical importance as a British Overseas Military Area (BOMA), in which District Councils were initially established, as discussed in Chapter Five (section 5.2.1). While Karonga Town became a site of colonial administration, the British ostensibly had very little interest in planning the development of Karonga Town, and the Northern Region more broadly, since most agricultural

estates and colonial settlements were concentrated in the South. Karonga Town, and other emerging settlements in the North, were thus left largely to themselves under the system of indirect rule, as discussed in Chapter Five (section 5.1.5 and 5.2.5).

The lack of formal state presence in the North is, however, beginning to change as the region begins to urbanise from a low base, as demonstrated by the preparation of urban structure plans not only for Karonga Town and Mzuzu, but also for smaller towns, such as Chitipa and Songwe, as discussed in Chapter Five (section 5.2.5). But without the devolution of powers under the Decentralisation Policy, these plans are unlikely to be implemented in the absence of sufficient local capacity and resources.

Overall, the case of Karonga Town supports a theory of rural governance regime change as influenced both by historical factors linked to the region's low urbanisation level, limited formal state presence, and hereditary chieftaincy structure, and by contemporary factors linked to processes of in situ urbanisation, the hybridisation of the local governance structure following the establishment of modern institutions, and the social relations that have emerged between chiefs and officials who not only conflict with one another when their authority is challenged, but also who mutually accommodate one another when their interests align. In such cases, the hybrid nature of local governance is strongly shaped by the dynamics of negotiation between competing institutions as they struggle to plan and manage the urbanisation of traditional rural settlements based on rationalities that sometimes conflict, and sometimes align. It is these dynamics that ultimately condition the prospects for planning healthy urban environments in Karonga Town.

Theorising the nature of political bargaining environments in small African towns

The theoretical contributions above demonstrate that decision-making processes and planning procedures are often driven by the interests and rationalities of particular stakeholders rather than by a commitment to normative principles (e.g. the healthy city), which may have little meaning or buy-in outside of official plans and policy documents. The observation in Karonga Town that planning decisions are made in highly political environments in which stakeholders (formal/modern and customary) decide which regulations to follow and which to disregard depending on the perceived benefits of individual development projects supports Goodfellow's (2013) assertion, informed by the case of Uganda and Rwanda, that planning outcomes are often shaped more by 'political bargaining environments' than by "economic factors, bureaucratic capacity or the nature of the urban policies and regulations in place" (ibid: 1).

In such environments, official plans and policies are often overridden to accommodate the mutual interests of governing elites (in this case, District officials and councillors, Members of Parliament, and chiefs) who may have few if any incentives to enforce or follow regulatory frameworks, regardless of the environmental consequences. Future research aiming to theorise the nature of political bargaining environments in cases such as Karonga Town should therefore focus more on what actually happens in decision-making processes and planning procedures outside formal arenas, especially in the absence of a local state, rather than on what planning is supposed to achieve in line with official policy directives and statutory procedures. Such research would help to broaden theories of urban governance in smaller African urban centres based on the experience of Karonga Town. The institutional hypotheses outlined below provide a set of entry points for future research with this aim.

11.2.2 Situating smaller African towns as a terrain of urban research and theory-building

The major conceptual aim of this study was to develop a new analytical framework based on Healey's (2011) notion of 'contingent universals'; "understanding what is specific to a place and what can be shared learning across different localities and contexts" (Watson 2016: 38). On the one hand, this is a challenging endeavour given (a) the phenomenal diversity of smaller urban centres and the circumstances particular to each, which renders universal generalisations and theoretical prescriptions problematic (Hardoy and Satterthwaite, 1986), and (b) the specificity and 'individualising' nature of case studies, which do not always facilitate comparison or theory-building (Robinson 2011), as discussed in Chapter Four (section 4.3).

On the other hand, some general conditions facing smaller urban centres are identifiable in the literature: population growth (unplanned); weak local governance; strong rural-urban linkages; low connectivity with global economic systems; high levels of income poverty; risk accumulation cycles; and low levels of basic service provision (Dodman et al. 2009; Hardoy et al. 2001; Hewett and Montgomery 2001; Montgomery et al. 2004; Montgomery 2009; Roberts 2014; Satterthwaite 2016a; UN-Habitat 2006). While these conditions may apply to some smaller urban centres more than others (for example, the findings from the 2010 Malawi DHS indicate that smaller urban centres are both among the best and worst served by basic infrastructure), they imply that there is something *specific* to their character that could be *shared* across them.

What follows is the identification of lessons in the form of hypotheses that emerge from Karonga Town that may be of broader potential relevance to similar cases. The intention is not to provide a universal theory or simplistic generalisations about smaller urban centres, which would be

counter-productive for the reasons above. The intention is rather to help build a shared understanding of them as a context of urban research, theory-building and practice through the development of detailed empirical insights. Key questions include: What is distinct about in situ urban change in emergent African towns? What is distinct about environmental health problems in emergent African towns? What is distinct about the practice of urban planning in emergent African towns? What lessons can be shared across similar places? Whether or not the lessons from Karonga Town can be shared more broadly is a question that can only be answered through further case study research, discussed below.

11.3 Implications for future research

Understanding what may be specific about environmental and planning dynamics in African towns and the lessons that may be shared across them requires further case study research. To provide a way forward, several hypotheses stand out from the findings that could be tested in cases similar to Karonga Town, providing an agenda for future research. The hypotheses relate to the demographic, environmental and institutional situations particular to smaller African towns and are presented with the intention of being tested and developed in Malawi and other sub-Saharan African countries. The methodological challenges of doing so are discussed below.

Demographic hypotheses

- The number of smaller urban centres and the share of the urban population they account for is likely underestimated in countries lacking clear criteria for defining the upper and lower thresholds of urban centres. If this this is the case, urban primacy may be less significant than traditionally thought.
- While many smaller urban centres may be growing rapidly, their contribution to total urban population growth is relatively small if a significant share of the urban population lives in large cities, but only if their populations are growing.
- Smaller urban centres may be among both the fastest and slowest growing urban centres. If so, sensationalised statements and universal generalisations concerning the pace of their growth and their contribution to total urban growth need to be treated with caution.

The absence of a clear definition of urban areas and a lack of census data disaggregated for individual urban centres of different sizes and locations presents major challenges in addressing these hypotheses. The four tier settlement hierarchy developed by Manda (2013) and

subsequently adopted by the NSO and Physical Planning Department provides an opportunity to improve future census data for both statistical and policy purposes in Malawi.

Environmental hypotheses

- Levels of provision of piped water in the home, flush toilets and electricity connections tend to decline the smaller the urban size, with the smallest urban centres being among the most ill served. Lower levels of provision of these services may or may not correspond with higher incidences of related environmental health outcomes. If not, other determinants, such as urban density levels, which are generally higher in larger urban centres, may be at play.
- Urban populations at different levels of the settlement hierarchy may suffer from an 'urban penalty' according to certain indicators (e.g. prevalence of diarrhoea among children under the age of five years). However, drawing conclusions about urban health based on certain indicators may not be helpful given the complexity of environmental health and its socio-spatial distribution.
- A large share of total health outcomes in smaller African towns may be linked to infectious and parasitic diseases and accidental injuries attributable to poor water and sanitation, air pollution and occupational hazards.
- Structural transformation in the economy of smaller African towns may lead to a rise in environmental health problems associated with occupational hazards (inhalation of particulates, injuries, road traffic accidents) among working age populations and to changes in their social distribution between women and men and other groups (e.g. migrants).
- High levels of reliance on biofuels for cooking may disproportionately affect the health of women and young girls in households where they are responsible for cooking, but this depends in large part on whether cooking happens indoors or outdoors and on housing quality (ventilation). In smaller African towns with low densities, cooking may occur more frequently outdoors than in larger urban centres with higher land pressures, limiting exposure to air pollution arising from burning bio-fuels.
- Infants and children constitute a large share of all environmental health outcomes, particularly those linked to infectious and parasitic diseases. This may be reflected by higher under-5 mortality rates in smaller versus larger urban centres. If not, other intervening determinants (e.g. density and overcrowding) may be at play.
- Environmental health outcomes (endemic and epidemic) tend to be concentrated in the poorest and most ill-served traditional/non-statutory settlements.

- African towns are complex systems in which the many determinants of environmental health interact in overlapping and mutually reinforcing ways. The nature of these interactions may be made more complex in the absence of functional and elected Town Councils, strong planning departments and flexible regulatory frameworks. In such cases, environmental hazards may be multifarious.

The lack of detailed demographic and health data available for individual urban centres, particularly for the smallest ones, present major challenges in addressing these hypotheses. At the sub-national scale, the sample used by the DHS is not representative of individual urban centres and the geographic offset it uses to protect the confidentiality of household respondents increases the risk of misclassification errors, limiting the validity of DHS data for inter-urban analysis. Future research seeking to test the first hypothesis will likely run into the limitations outlined in Chapter Seven (section 7.7).

At the town-scale, the field work uncovered a surprising amount of health information, including hospital records, population registers and household surveys on Water, Sanitation and Hygiene (WASH) for individual villages, and experiential knowledge of environmental health problems at the household and village scales. Many of the Health Surveillance Assistants (HSAs) who were followed keep up-to-date population registers and conduct regular household surveys and know how many people (including the number of new-born babies) and households there are in their villages, how many of those households have access to piped water connections and how many rely on unsafe sources, how many households have access to different types of sanitation facilities and how many share with neighbours.

Therefore, while smaller urban centres are commonly labelled 'data poor environments', the case of Karonga Town demonstrates that demographic and health data are routinely collected, but may not be known, accessible or recorded in an easily collectable format. Local information sources should nevertheless be combined to provide a more accurate and detailed picture of environmental health wherever possible.

Institutional hypotheses

- A history of unplanned urban growth in rural territories is associated with a rise in tensions and conflicts between customary and formal institutions where the former is struggling to maintain territorial control and the latter is seeking to incorporate populations into planned townships. Conflicting rationalities between notions among officials of what it means to live in 'proper' (planned) environments and notions among

chiefs of what it means to live in traditional settlements may be heightened in these contexts as a result.

- Conflicting rationalities between customary and formal institutions in African towns are insufficiently explained by informality since many settlements were constructed according to traditional rules and norms that pre-date formal planning systems. In such cases, conflicting rationalities are historically embedded in evolving social relations between pre-existing social institutions and emergent modern institutions and should be conceptualised rather as a form of 'traditionality'.
- Conflicting rationalities between customary and formal institutions evolve as their structures transform in the face of processes of in situ urban change linked to urbanisation, the commercialisation of customary land markets, and the institutionalisation of the local state.
- Notions of traditional settlements as 'informal' or 'illegal' may intensify with the commercialisation of customary land markets, leading to new state-society relations that may be equally problematic if they are not accepted as a legitimate form of urban development. In such cases, conflicts between the local state and private developers may become increasingly intense.
- Conflicting rationalities do not always result in conflicts between customary and formal institutions, but also in moments of 'converging rationalities'. These moments represent a form of mutual accommodation and emerge from the dynamics of negotiation and convergence between institutions with competing rationalities, but mutual interests.
- The implementation of the formal planning system depends in large part on the existence of a functional and elected local government that is socially legitimate and respected. Where they are non-existent, decision-making may be dictated by political and economic considerations rather by the regulatory framework, and planning outcomes may reinforce environmental risk accumulation cycles as a result.

Testing the hypotheses above requires detailed case studies that have strong ethnographic components capable of documenting the experiences of planners and other stakeholders as they attempt to influence decision-making and that aim to inform planning theory that is built on an in-depth understanding of planning practice in particular urban governance situations. This aim can be supported by engaging with what Liggett (1996) initially termed the *practice movement* in urban planning, which has gained increasing traction as an approach to theory-building by observing the practices of planners, their interactions and their impacts through detailed case study research (Robinson 2011), as discussed in Chapter Four (section 4.3). In cases such as Karonga Town, I argue for this approach to be expanded beyond formal planning arenas

to capture the broader governance of decision-making, with a particular emphasis on the role of customary institutions in shaping the urbanisation of rural territories.

The case of Karonga Town further demonstrates the need for ethnographic approaches to case study research to account for the evolution of planning systems and the challenges faced by planners and other government officials in the face of pre-existing customary rules, norms and traditions. The most useful methods will be qualitative, but due to the formal nature of interviews, the study demonstrates the value of informal observations and discussions to understand what actually happens in decision-making, who is involved (formally and informally) and to what effect.

11.4 Implications for practice

The research findings emphasise the clear need for an urban environment in Karonga Town that is both healthier and more resilient to environmental hazards of different sizes and frequencies. In the absence of a Town Council, however, there is no governance structure to facilitate planning and decision-making at the urban scale. NDRMCs represent the closest institutional platform, but they tend to operate in isolation, despite the need to share information and lessons learnt, coordinate interventions at the urban scale, and address environmental and biological hazards (floods, disease outbreaks) that transcend village and neighbourhood boundaries.

While major reforms are required to strengthen and legitimise Karonga Town's governance structure, the findings point to several action areas with the potential to improve the information base and frameworks necessary to inform future urban planning activities at the local level. They are as follows:

Disaggregate the Karonga HMIS to inform planning at the urban scale

That a large share of all reported diseases and health conditions in the town is attributable to environmental hazards and that as much as 44% of the annual inpatient population (between August 2016 and July 2017) came from villages in the town suggests that Karonga District Hospital needs to better understand the environmental health situation at the urban scale to ensure its services are aligned with local needs.

This can be supported by integrating the sampling procedure used to disaggregate inpatient records for urban villages as part of the standardised data management procedure currently used by the Karonga HMIS. This would require simple changes to the way in which health

information is routinely recorded. For example, creating a specific category for urban cases would enable the generation of basic statistics on morbidity and mortality outcomes and their socio-spatial distribution at the village and town-wide scales. At present, the HMIS is only disaggregated during disease outbreaks for the purposes of targeting surveillance and WASH interventions. This approach is reactive and unable to actively promote health. Enhancing access to health information on everyday health conditions could help to inform interventions aimed at addressing underlying environmental risk factors linked to, for example, poor water and sanitation, which are known problems in the town.

However, the HMIS is not fully digitised. Only the outpatient registers are stored on computers, while the inpatient registers are in hardcopy format. Consequently, the sampling procedures can only be applied to the outpatient wards. Additional variables beyond age, sex and village could also be included in patient registers to enable intersectional analysis of the socio-spatial distribution of different health outcomes, including for example:

- Occupation
- Nationality
- Physical and/or cognitive disabilities
- Income
- Migration status (rural-urban, urban-urban)

Urban health information generated by the HMIS would primarily benefit the hospital by informing the type of services it needs to provide in the town, including not only preventative and curative health care, but also health promotion. Supporting this latter approach could be supported by making health information available to NDRMCs with the support of HSAs in order to refine risks diagnoses, update the strategic directions of action plans, inform interventions, and monitor and evaluate the impacts of local projects. However, due to the limitations associated with hospital data, as discussed in Chapter Six (section 6.4), other forms of health information would need to be drawn on to validate observations. In that regard, researchers at Mzuzu University should continue to support the NDRMCs through building their capacity to collect and use local data.

Use a complex systems framework to inform strategic action planning

Using a complex systems framework to understand the interactions between the many determinants of environmental health can add value to strategic action planning at the NDRMC level in several ways:

- Understanding the interactions between environmental hazards of different frequencies and intensities and how they overlap and mutually reinforce one another.
- Understanding variations in susceptibility to environmental hazards within and between villages and neighbourhoods based on social identity and status.
- Understanding environmental hazards that transcend neighbourhood boundaries from a town-wide perspective.
- Understanding feedback loops, including negative feedback loops that maintain equilibrium (drainage channels that prevent flooding) and positive feedback that contribute to irreversible instability (informal development in drainage channels that exacerbates flooding).
- Understanding that planned interventions may have unintended outcomes (repairing the dyke could worsen flooding in settlements on its opposite side).
- Understanding the need for localised interventions to address the multiplicity of interactions that affect environmental health.
- Understanding the self-organising capacity of local stakeholders.
- Understanding the need for joined-up governance to facilitate interactions between the many stakeholders involved in urban planning, public health and DRM.

Complexity thinking can be operationalised based on the framework developed in Chapter Three (section 3.1.2) and later used in Chapter Nine (section 9.2) to support what is termed a 'causal web analysis' of environmental health beyond the determinants in the immediate environment to include socio-economic determinants (limited household income), cultural determinants (customary norms and practices), institutional determinants (limited capacity to provide basic services), political determinants (tensions and conflicts between stakeholders) and their complex interactions (revisit Figure 9.40). This way of thinking is particularly useful for analysing health problems with known environmental causes because it requires attendant causes to be addressed together within an inter-related chain, requiring a holistic and non-linear approach. This approach would be of value to NDRMCs in guiding workshops aimed at refining risk diagnosis and identifying local interventions that address the multifarious causes of environmental hazards and related health outcomes.

Expand the four-tier settlement hierarchy and use it for statistical and policy purposes

Implementing decentralisation to promote the growth and development of smaller urban centres must address three key questions: (a) what share of the urban population live in these centres and which ones are growing, at what rate, and where; (b) what are their current and

future needs for basic services and how are these needs distributed and likely to change with urbanisation; and (c) what roles do these centres play in rural and regional development, particularly in terms of service provision, providing non-farm employment, and serving as mobility nodes for migrants, and what institutional capacity challenges do they face?

These questions could be addressed by expanding the four-tier settlement hierarchy to include not only information on urban size distributions, but also on other urban characteristics and functions, such as density, institutional capacity (existence of a local government), access to public facilities (hospitals) and basic services (water, sanitation and electricity), and occupational structure (farm versus non-farm economy). Information on these characteristics, many of which are also key determinants of environmental health, can be collected from the DHS and other national and ideally sub-national surveys, and from interviews and other qualitative sources. This information would provide decision-makers with a stronger basis to direct scarce resources toward needed infrastructural and institutional investments at the sub-national scale.

Increase the coverage of census reports by publishing figures on individual urban centres

The adoption of the four-tier settlement hierarchy reflects a growing recognition of the need for detailed census data on urban size distributions to inform national and local planning and investment. To provide these data in a form that is easily accessible to planners and decision-makers, census reports for 2018 should provide figures for individual urban centres at each tier of the urban hierarchy based on clear statistical criteria. The NSO should consider consulting the Physical Planning Department to determine the type of datasets its staff require. Particular attention should be paid to the types of capacities that need to be built so that planners and decision-makers in smaller urban centres can use these data to inform their planning activities.

Profile urban centres throughout the country

UN-Habitat supported universities in Malawi, including the Department of Land Management at Mzuzu University, to develop profiles for the four largest cities (see UN-Habitat, 2011) on critical urban development issues (planning, governance, housing, service provision). But these profiles do little to address the paucity of information available to local stakeholders in the 40 other urban centres throughout the country.

The existence of urban planning programmes at Malawi Polytechnic in the Southern region and Mzuzu University in the Northern region provides an opportunity to develop profiles for a broader range of urban centres in different areas with the possible support of UN-Habitat or other international agencies, such as Cities Alliance, which is also active in Malawi. The 44 urban

centres identified in Chapter Six could serve as an initial framework for selecting those to be profiled across the four-tier settlement hierarchy, providing more detailed information on the urban situation that could be used to inform local decision-making and further research. This framework could be refined through analyses of the 2018 census.

11.5 Reflections on using the new analytical framework

The analytical framework is proposed here to guide future research aimed at developing empirical, theoretical and practical insights into the changing nature of environmental health, and the planning systems that shape its quality, in other smaller African urban centres. This section identifies four key vantage points the framework revealed and discusses their implications for developing the hypotheses above.

First, conventional urban health frameworks tend to focus narrowly on the characteristics of urban living (the built and natural environment, occupational hazards, food insecurity) that impact health in largely deterministic and linear terms, as discussed in Chapter Three (section 3.1.2). In contrast, the framework's demographic and ecological lenses required the characteristics of people and the environments in which they live and work to be considered not only together, but also in relation to processes of urban change linked, in this case, to in situ urbanisation, structural transformation and the deinstitutionalisation of the local state. These lenses required insights from gender, intersectionality and urban change to be combined into a single framework, emphasising environmental health as an evolving socio-spatial construct rather than as an isolated outcome. Complexity thinking provides a useful approach for bringing these lenses together to better understand the interactions between the environment and health, and society and governance.

Second, the institutional lens enabled the analysis to go beyond describing environmental health as an observable phenomenon toward explaining its underlying structural causes. This lens had important methodological implications in requiring qualitative data on the complex interactions between local stakeholders as they attempt to influence decision-making in highly political environments. The most fruitful insights for researchers interested in developing the institutional hypotheses above are likely to come from ethnographic methods since they enable researchers to embed themselves in the social environment in which planning decisions are made.

Third, the framework's situated nature required the circumstances particular to Karonga Town to be identified, revealing not only the specificity of the case, but also its exceptionality. For

instance, not all smaller African towns may be growing as rapidly as Karonga Town—if at all—or be as exposed to the same degree of environmental hazards. Indeed, the town's hazard profile—ranging from biological pathogens, to seasonal floods, to large earthquake disasters—is likely an exception to the norm.

Lastly, the framework's emphasis on better understanding environmental health and the planning systems that shape it in smaller African urban centres yielded practical insights for local stakeholders interested in planning healthier urban environments in Karonga Town and at higher levels. The framework's applied focus reflects the recognition that planning research should seek to both learn from the experience of planning practice in different urban governance contexts, and build theory from this experience, as advocated by the *practice movement* in urban planning (see Watson 2002). In the absence of a local government, however, the science-policy interface is particularly difficult to locate in Karonga Town, and while the NDRMCs have some potential to translate new information (including risk maps) into practice, they do not represent a sustainable or entirely democratic solution for the reasons outlined above.

The framework's emphasis on urban governance nevertheless positions the local scale as the locus of research, theory-building and practice, providing an opportunity to produce the type of information that local stakeholders require to make better decisions. The politics that pervade decision-making processes, however, present major challenges for knowledge exchange and information sharing. There is a risk that new information will be selectively applied or manipulated to serve the interests of particular stakeholders in accordance with their rationalities. For instance, chiefs could use information on the distribution of flood events and related health outcomes (cholera, diarrhoea, dysentery) to advocate for the provision of water and sanitation in hazard-prone areas, whereas officials could use the same information to justify the removal of unplanned or 'informal' settlements they deem to be too hazardous for habitation. The ability of researchers to *speak truth to power* through their research may thus prove especially challenging in contested planning systems, requiring researchers to understand local power dynamics and their implications for urban research, theory-building and practice.

11.6 Concluding remarks

Karonga Town embodies the demographic, environmental and institutional challenges faced by many other smaller African towns; it is rapidly growing, poorly served, exposed to numerous environmental hazards (everyday, small and large), and lacks the institutional capacity to

respond. The town's environmental situation is likely to become worse as a result, posing a major threat to its potential as an emerging centre of rural and regional development.

But the town's future is not all doom and gloom. Urban ARK has shown what communities are capable of achieving when they are empowered to work together with the support of researchers from local and international universities. Through research projects such as ReMapRisk, Karonga Town has become a pioneer in developing innovative methodologies both to understand the spectrum of urban risk and address it. It is my hope that this study has made a small, but meaningful contribution to Urban ARK through deepening an understanding of the environmental health situation in smaller Malawian urban centres and their prospects for planning healthy urban environments in these contexts.

Karonga Town is, however, one among many smaller African towns we still know little about. Addressing this knowledge gap will require more detailed demographic and health data that are disaggregated for individual urban centres, particularly those at the lower end of the urban hierarchy, and further case study research and theory-building of the kind advocated here. The prospects for planning healthier environments do not depend solely on more and better information, however. As the case of Karonga Town demonstrates, the institutional context in which urban planning systems are embedded determine their effectiveness to a large degree. In such cases, planners who view their practice as a technical activity in non-political decision-making environments do so at their own peril.

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Annex I: List of villages in the old and new town boundary

OLD BOUNDARY

1. Adam
2. Kafikisila
3. Kasote/ Sadala
4. Katesula
5. Kwiyula
6. Luhimbo 1
7. Luhimbo2
8. Malema 1
9. Malema 2 (also known as Mwankiyo)
10. Malema 3
11. Mungete
12. Mwabulambo
13. Mwafilaso
14. Mwafilaso 3
15. Mwahimba
16. Mwahowoke
17. Mwakifwamba
18. Mwaleba 1
19. Mwaleba 2
20. Mwamalopa 1
21. Mwamalopa 2
22. Mwamatope
23. Mwambetania
24. Mwambetania
25. Mwambuli 1A
26. Mwambuli 1B
27. Mwambuli 2
28. Mwanganda
29. Mwangolera
30. Mwangolera (also known as Mkambara)
31. Mwangwabila
32. Mwangwebo

33. Mwanjabala
34. Mwanyesha
35. Mwanyongo (also known as NgayaMkafu)
36. Mwawembe
37. Mweneyumba
38. Peter Mwangalaba
39. Shem Mwakasungula
40. Wabola
41. Sadala
42. Mkaka 1
43. Mkaka 2
44. Mwabati 1
45. Mwabati 2
46. Katesula 2

NEW BOUNDARY

47. Mwangolesa
48. Yafeti Mwakasungula (also known as Mwangwebo)
49. Vokolani
50. Mulindanyifwa
51. Melere
52. Ngosi
53. Mwasota
54. Mwenegube
55. Rasha
56. Kasokesa
57. Mwandosha
58. Mbweli
59. Mwakirama

Annex II: Socio-economic impacts of environmental health problems in smaller urban centres

Reinforcing household poverty traps

Poverty traps pose major threats to the development of smaller urban centres since they contain a large share of the world's urban poor (World Bank and IMF, 2013). Health problems can reinforce household poverty traps by disrupting wage earning, creating additional health care costs, worsening reproductive work burdens typically carried out by women (child care and caring for the sick and injured), and creating health risks for particular family members (women and girls are often fed less and/or last when money is tight, increasing risk of malnutrition and stunting) (Brown and Dodman, 2014; Pryer, 1993; Tacoli, 2012).

Discouraging migration

Diseases and poor services in smaller urban centres may discourage migrants seeking safe living and working environments (Christiaensen and Todo 2013; Proctor 2014). A study in Ethiopia found that rural migrants often worried about the scourge of malaria in towns (Baker 2012). Another study in Zambia found that professionals frequently leave small towns due to sub-standard services, making it difficult to retain qualified personnel (Nchito 2010). Poor environmental conditions and health in smaller urban centres could undermine rural economic diversification and structural transformation by hindering the productivity of labour and discouraging migration into the non-farm economy (Christiaensen and Todo 2013; Proctor 2014). This could reinforce urban primacy by pushing migrants to the largest cities.

Increasing costs of living

Poor services can increase living costs for low-income households, further limiting their ability to afford health care (medicine) and other health promoting services (safe drinking water) (Mitlin and Satterthwaite 2013). A study of the Ugandan town of Kumi found that the absence of a reliable public water system meant that virtually all households relied on water kiosks or water vendors; a family earning the average daily wage and consuming 24 litres per person per day would spend 45% of their income if they relied on vendors (UN-Habitat 2006: 42). Other studies show that poor households often spend more for the same quantity of water purchased from vendors than more affluent households with piped connections, suggesting it is "expensive to be poor" (Kjellén and McGranahan 2006: 17).

Increasing costs and decreasing productivity

Poor services (electricity, water and sanitation) can be especially costly for small and micro enterprises (Hewett and Montgomery, 2001), which typically account for a large share of low-income groups in smaller urban centres (UN-Habitat 2006). Given that many households in smaller centres simultaneously engage in farm activities (either for consumption or commercial purposes) and non-farm activities (such as home-based enterprises and/or micro-scale manufacturing), poor provision can hinder both productive and reproductive work (ibid). Women may be disproportionately affected since they tend to dominate the non-farm economy in some small African towns, as observed in Ethiopia (World Bank 2009). Reductions in profit from the added cost of accessing services may also reduce the income available to owners and employees of small enterprises, making it more difficult to afford the cost of services, such as metred water and electricity connections.

Annex III: Health risks in the urban environment

Health risks in the urban environment include biological pathogens, chemical pollutants, access to natural resources, natural resource degradation, physical hazards, climate change, and deficiencies in the built environment (Hardoy et al., 2001; Kjellstrom et al., 2007; Kovats and Akhtar, 2008; Mitlin and Satterthwaite, 2013; Satterthwaite, 1993). The following section then identifies diseases and health conditions that are associated with these risks in order to determine those with environmental causes.

Biological pathogens

Biological pathogens in the water, air and soil account for most urban health burdens in low- and middle-income countries (Hardoy et al. 2001). Many pathogens live, breed and feed in and around the home and neighbourhood, for example, malaria (*Anopheles* mosquitoes) and diarrhoeal diseases (houseflies, blowflies and cockroaches) thrive in environments with poor water and sanitation, drainage, and waste collection. Other diseases carried by insects, mites and spiders thrive in these environments as well, for example, dengue (*Aedes* mosquitoes), yellow fever (*Aedes* mosquitoes), typhus (fleas and body lice), plague (fleas), leishmaniasis (sandfly), and hepatitis A (cockroaches and houseflies) (Satterthwaite 1993). Acute respiratory infections (such as pneumonia) are also strongly linked to overcrowding, inadequate ventilation, dampness, and indoor air pollution from the burning of biomass fuels (such as wood, charcoal and wood) (ibid).

Unsafe wastewater re-use and poor handling and storage can transfer pathogens onto food, causing diarrhoeal disease (dysentery, cholera) and intestinal worm infections, including ascariasis (roundworm), trichinosis (whipworm) and taeniasis (beef and pork tapeworm) (Birley and Lock 1999; Hardoy et al. 2001). Inadequate facilities for preparing and storing food combined with overcrowding can intensify risk of these and other foodborne diseases, including botulism, typhoid fever and parasitism (Satterthwaite 1993; Hardoy et al. 2001). It is thus difficult to separate the health impact of food preparation and storage from unsanitary conditions given the interactions in and around the home between personal hygiene and food, and water, sanitation, animals, and flies (Hardoy et al. 2001).

Poor environmental conditions combined with inadequate health care and immunisation programmes reinforce the spread of infectious and parasitic diseases through airborne, waterborne and foodborne infections or contact (Satterthwaite 1993). Most are preventable, but remain major causes of morbidity and premature mortality in low- and middle-income

countries (ibid; Hardoy et al. 2001; Mitlin and Satterthwaite 2013). Some disease epidemics (such as cholera) have even caused enough deaths to qualify as 'disasters' (IFRC 2010), although the relative importance of everyday health hazards cannot be under-estimated, as discussed in Chapter One (section 1.1.1).

Chemical pollutants

Urban environments concentrate various chemical pollutants that affect health, including lead (in water, food, air and paint), asbestos (in building insulation), indoor air pollutants from fuel combustion (including cooking fuels), toxic waste from industrial sites, and outdoor air pollutants from industry and motor vehicles (Cohen et al. 2005; Frumkin 2002; Hardoy et al. 2001; Satterthwaite 1993).

Indoor emissions from biomass fuels are a growing public health concern (Mitlin and Satterthwaite 2013). While most health research on indoor air pollution has focused on rural areas, where households typically rely on bio-fuels, growing evidence suggests that a large share of the urban poor rely on bio-fuels as well (ibid; Hardoy et al., 2001; Satterthwaite, 1993). A study by Dutta and Banerjee (2014) analysed the relationship between morbidity, socio-economic and demographic variables and fuel use in Kolkata (India). The findings indicate that the incidence of morbidity associated with indoor air pollution was higher in 'slums', suggesting that living conditions and indoor smoke have a significant impact on health, and that women living in 'slums' had higher incidences of morbidity than men, suggesting that women may be more exposed since they are typically responsible for cooking.

Another growing urban health concern is outdoor air pollution. Cohen et al. (2005) used models for all 14 WHO regions to estimate concentrations of inhalable particles from exposure to outdoor air pollution, including measurements for 3,211 urban centres worldwide with more than 100,000 inhabitants. Burden estimates were based on mortality from cardiopulmonary causes in adults, lung cancer and acute respiratory infections in infants under the age of five years. The estimates suggest that the burden of disease caused by urban air pollution measured in terms of DALYs is concentrated in low- and middle-income countries, particularly in Asia (ibid).

Other health impacts of chemical pollutants in the urban environment include chemical wastes dumped into water bodies or onto land sites without proper treatment, and occupational exposures in the workplace, including chemical agents, dust, inadequate lighting, ventilation and space and inadequate protection from machinery and noise (Hardoy et al. 2001).

Physical hazards

Physical hazards (including flood, drought, land-slides, earthquakes, road traffic accidents, and shack fires) are major causes of premature mortality and injury, particularly where urban development occurs in hazardous areas, such as flood plains, low-elevation coastal zones, steep slopes, solid waste dumps beside open drains and sewers, or in polluted industrial areas (Hardoy et al. 2001; Mitlin and Satterthwaite 2013). In such areas, physical hazards typically account for most premature death and injury from large-scale disasters (IFRC 2010; Mitlin and Satterthwaite 2013).

Accidents are another major cause of mortality worldwide (Hardoy et al., 2001; IFRC, 2010; Mitlin and Satterthwaite 2013). The WHO (2011) estimates that as many as 1.3 million people die every year from road traffic accidents, 90% of which occur in low- and middle-income countries, and that nearly half of all those who died were pedestrians. However, data on road traffic accidents are not disaggregated for urban or rural areas (Mitlin and Satterthwaite, 2013).

Other accidental injuries (such as burns, scalds and accidental fires) are linked to poor quality and overcrowded housing (Satterthwaite 1993; Hardoy et al. 2001). For example, accidental fires are strongly linked to overcrowding, lack of fire breaks, use of combustible fuels for cooking, use of candles, haphazard electrical wiring, flammable building materials, and lack of ingress and egress for emergency services (including ambulances and fire trucks), conditions commonly found in unplanned settlements (Pelling and Wisner 2009; IFRC, 2010). According to one study on Cape Town (Pharoah 2009), of the 18,504 fire incidents that occurred between January 1995 and December 2004, 8,554 (46%) occurred in such settlements.

Access to natural resources

Access to natural resources (such as food, fresh water, fuel, forests, and land) is vital for health (Satterthwaite 1993). But while ecosystems define the availability of natural resources, socio-economic and political factors determine who can access them (Satterthwaite 1993). For example, poor urban households are often denied access to land for farming, thereby limiting their ability to produce food (Allen and Frediani 2013). Conversely, urban agriculture can promote vector-borne diseases (such as malaria, schistosomiasis and filariasis) by diverting surface water for irrigation (Birley and Lock 1999), while livestock rearing can promote communicable disease (such as salmonellosis, brucellosis, and tapeworm infections) and zoonotic diseases (ibid).

Poor urban households often lack access to fresh water since many are denied access to piped connections due to their informal or 'illegal' status or to the limited capacity of local governments to provide sufficient connections (Satterthwaite 1993; Hardoy et al. 2001). In Africa, between 100 and 150 million urban dwellers (35% to 50% of the total urban population) were estimated to lack provision of adequate water in 2000 (UN-Habitat 2003). Unwillingness to pay does not explain why poor urban households lack access to safe drinking water (Hardoy et al. 2001). Residents of unplanned settlements often pay substantially more for water from informal vendors than their formal counterparts with piped connections (Kjellén and Mcgranahan 2006).

The urban poor also experience similar difficulties accessing food markets, which are monetised in urban areas due to a combination of income deprivations (affordability) and non-income deprivations (access to basic services, quality housing and exposure to environmental hazards), posing major threats to food security and nutrition (Tacoli 2017). Ensuring that lower-income groups have adequate and nutritious diets thus depends not only on food production, but also on food consumption linked to access and affordability (ibid).

Natural resource degradation

Most health research on natural resource degradation has focused on pollutants from urban-based enterprises and households (Satterthwaite 1993). The impacts of poorly planned and managed urban growth and expansion on natural resources are of growing concern, especially in ecologically sensitive areas (such as watersheds, floodplains, coastal zones, and forests) (Hardoy et al. 2001). The potential health impacts of natural resource degradation include malnutrition linked to food insecurity, disease linked to air and water pollution, loss of medicine derived from plants and vegetation, and diseases linked to deforestation and air pollution (Myers et al. 2013; Satterthwaite 1993). There are thus strong links between natural systems, human activities and health.

Climate change

The impacts of climate change are already observable and are expected to affect health in various ways, ranging from changes in the transmission of infectious and parasitic disease (such as malaria), to worsening existing environmental hazards (such as floods, drought and heat stress), to affecting life-support systems (through damage to and destruction of natural resources), to declining food supplies (Smith et al. 2007). These impacts are expected to be direct (such as the health impacts of floods) and indirect (such as malnutrition from economic

instability that climate change may have contributed to) (McGranahan 2007). Most research has focused on direct health impacts, since their associations are clearer.

Table 2.2 outlines possible ways in which changes in climatic means and extremes are expected to directly impact health. It is expected that many of these impacts will be concentrated where the current burden of climate-sensitive disease (such as diarrhoeal diseases, malnutrition, malaria and dengue) is already high, as in many low- and middle-income countries (Kovats and Akhtar 2008).

Table Annex 11.1: Examples of how climate change is expected to impact health

Health risks	**Climatic changes**		
	Floods, windstorms and storm surges	**Droughts and wildfires**	**Rising temperatures and heatwaves**
Injury	Collapse of shelter and other infrastructure; contact with submerged objects, vehicle incidents	Burning injuries from wildfires in peri-urban zones; violent conflicts over water	Work-related injuries as a consequence of overheating
Temperature stress	Loss of housing leading to exposure to ambient temperature extremes	Lack of water exacerbating effects of thermal stress	Thermal stress, enhanced by urban heat island effects
Faecal-oral diseases	Exposure to faecally contaminated floodwaters; damaged water and sanitation systems	Declining water resources leading to water supply interruptions and hygiene problems	Higher temperatures increasing risk of food poisoning (salmonellosis)
Respiratory diseases	Dampness and mould in the home environment, increasing susceptibility to respiratory diseases	Inhalation of smoke from wildfires, increasing susceptibility to respiratory diseases	Secondary chemical reactions within the urban atmosphere Levels of some pollutants
Vector-borne diseases	Altered breeding conditions for mosquitoes and other vectors, and loss of protective shields (windows, screens)	Altered breeding conditions for mosquitoes and other vectors; human population movements spreading disease	Altered distribution of mosquitoes and other vectors change, increasing disease transmission
Malnutrition	Crop damage and lower food supplies; loss of livelihoods and income-based access to food	Reduced agricultural productivity and food supplies	Loss of traditional crop production, leading to food shortages
Mental health	Psychosocial responses to danger, disruption, illness, displacement and losses	Psychosocial responses to danger, disruption, illness, displacement and losses	Psychosocial responses to discomfort

Adapted by McGranahan (2007) based on Few (2003)

Although detailed data on the urban health impacts of climate change are lacking, especially in sub-Saharan Africa, some tentative generalisations can be drawn from current projections. The most recent Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC) expects the following changes for Africa:

- Regional temperature changes, including warming across all sub-regions;
- Regional rainfall change, with drying over southern Africa, but other regional changes are less certain;
- Increases in the frequency and intensity of rainfall and temperature extremes; and
- Sea level rise (synthesised in Kovats et al. 2014: 9).

These changes should be viewed in relation to Africa's high levels of vulnerability, particularly in urban centres with their rapidly growing populations and weak planning systems (Kovats and Akhtar 2008; Parnell and Walawege 2014). Some of the most serious urban health risks that are likely to be affected by climate impacts in the region include:

- Increases in heat stress that may lead to increases in acute respiratory diseases, which may also be affected by the urban heat island affect;
- Changes in temperature and precipitation that may lead to shifts in the breeding grounds of vector-borne diseases (such as malaria) into previously unaffected areas;
- Increases in the frequency and intensity of flooding that may lead to increases in water-borne diseases and malnutrition, which may also be affected by poorly planned and managed urban growth;
- Increases in the frequency and intensity of drought that may impact food security by disrupting agricultural production and water security by exacerbating existing pressures on water supply; and
- Increases in the frequency and intensity of climate-related hazards (such as floods and storms) that may lead to increases in premature mortality and injury (Revi et al. 2014).

However, the precise ways in which changes in climatic means and extremes may interact with other stresses (such as macro-economic instability) and processes (such as urban growth and expansion) to impact urban health remain poorly understood, especially in the absence of detailed local data (including down-scaled climate models) in the region (Adelekan et al., 2015; Parnell and Walawege 2014).

The quality of the built environment

Various diseases and health conditions are associated with housing that is overcrowded, poorly built, located on insecure and/or hazard-prone land, and inadequately served by basic services (Haines et al. 2013; Hardoy et al. 2001; Lilford et al. 2017; Satterthwaite 1993). Some of the ways in which the built environment may impact environmental health are outlined in Table 2.3, while some of the more specific ways in which housing may impact environmental health are outlined in Table 2.4. The strong links between the urban living environment and health has attracted an increasing interest in the role of urban planning in health promotion and disease prevention in Africa (Smit et al. 2011; Smit and Parnell 2012; Oni et al. 2016), as discussed below.

Table Annex 11.2: Risk factors for disease and injury in and around the home and neighbourhood

Principal risk factor	Communicable diseases	Non-communicable diseases and injuries
Defects in buildings	Insect vector diseases Rodent vector diseases Geohelminthiases Disease due to animal faeces Disease due to animal bites Overcrowding-related diseases	Dust and damp and mould-induced diseases Injuries Burns
Defective water supplies	Faecal-oral (waterborne and water-washed) diseases Non-faecal-oral water-washed diseases Water-related insect vector diseases	Heart disease Cancer
Defective sanitation	Faecal-oral diseases Geohelminthiases Taeniasis Water-based helminthiases Insect vector diseases Rodent vector diseases	Stomach cancer
Poor fuel/defective ventilation	Acute respiratory infections	Perinatal defects Heart disease Chronic lung disease Lung cancer Fires/burns Poisoning Injuries Burns
Defective refuse storage and collection	Insect vector diseases Rodent vector diseases	Injuries Burns
Defective food storage and preparation	Excreta-related diseases Zoonoses Disease due to microbial toxins	Cancer

Hazardous location (near traffic, waste sites, industry)	Airborne excreta-related diseases Enhanced infectious respiratory disease risk	Chronic lung disease Heart disease Cancer Neurological/reproductive diseases Injuries Unintentional poisoning
Insecure tenure	All of the above	All of the above

Adapted from WHO (1997)

Table Table Annex 11.3: Housing deficiencies and potential environmental health outcomes

Housing deficiencies	**Potential environmental health outcomes**
Lack of screened housing, ceilings and open eaves	Malaria and other vector borne diseases, fly-borne diseases (diarrhoea, trachoma)
Lack of efficient, low-emission cook stoves or clean fuels (liquefied petroleum gas, biogas)	Acute respiratory infections in children, chronic obstructive pulmonary disease, Ischemic heart disease, burns/scalds
Lack of safe and clean (i.e. electric) lighting	Burns and household air pollution from kerosene and other lamps
Lack of ventilation, in appropriate albedo (white pain may increase reflection of sunlight and reduce heating)	Heat-related mortality and morbidity (converse in high altitude sites)
Fragile or inappropriate structure for location	At risk from extreme weather. Also injuries, gender-based sexual violence, mental illness, vector bore diseases
Lack of clean water supply, washing facilities, toilet	Diarrhoeal disease, trachoma, intestinal parasites, respiratory infections, malnutrition (especially in children)

Source: Haines et al. (2013)

Annex IV: Field work plan 2017

Research activities*	**Feb**	**March**	**April**	**May**	**June**	**July**	**Aug**	**Sept**
Arrive in Karonga 10 February 2017	Intro meetings							
National Committee on Science and Technology (NCST) ethics approval		*Submitted*						
			Approved					
Ethnography	*Informal observations/discussions*							
						Follow Along Participant Observation (FAPO)		
						Interviews		
Archival research			*Archival research of hospital records (records between August-April were collected retrospectively)*					
Quantitative analysis						*Analysis of census data*	*DHS sampling*	*DHS analysis*
Depart for London 8 Sept 2017								*Closing meetings*

Annex V: Interview guides

Serial number: __

Semi-structured interview guide for government officials (Physical Planners and service providers)

The semi-structured interview guide addresses research objective c and d:

- *To identify the constraints (socio-economic, institutional and political) facing the ability of local stakeholders (government, communities, local NGOs, and the private sector) to plan and manage healthier living environments in Karonga Town, particularly as it continues to rapidly grow and expand.*
- *To identify the type of enabling capacities that need to be strengthened so that these stakeholders can plan and manage healthier living environments in this context.*

QUESTIONS

- ***Introductory questions***
    - What kinds of development projects are you involved in (commercial, residential)?
    - What is your position and role in your business?

1) ***Socio-economic constraints***
    a) What income group do your development projects target?
    b) Who is meeting the housing needs of the urban poor (government, civil society, communities themselves?)
    c) What kinds of municipal revenue generating tools are currently available to help your department raise the local revenue it requires to fulfil its mandate?
    d) What are the major social and economic constraints (e.g. the composition of the labour force, the prevalence of poverty and informality) facing your department's ability to raise local revenue to fund basic service provision (focus on service relevant to department, such as water, sanitation) in the town?
    e) Are most residents able to afford the cost of accessing the services your department is responsible for providing? Do you have recent data on levels of access in the town? If so, would you be able to share this data?
    f) Are you aware of any low-cost technologies or planning solutions that could work to increase access for the poorest groups?
    g) What are the relevant regulations for the services your department is responsible for delivering? What share of the population in the town is currently able to afford the costs of complying with these regulations?
    h) Which regulations are unaffordable? Should they be reformed to make them more affordable and enforceable? If so, how?
    i) What share of the population in Karonga Town would you say lives in the following types of housing?

Record share for each housing type

Permanent housing (constructed with a combination of permanent and traditional materials)	Semi-permanent housing (constructed with a combination of permanent and traditional materials)	Temporary (constructed with sun dried brick, mud floors and grass thatch)
%	**%**	**%**

2) ***Institutional constraints***

a. What is your general view of the formal planning system?
b. Is the planning and building approval process efficient and affordable? If not, what needs to change to encourage compliance?
c. Does the planning system provide an enabling framework for the private sector to deliver housing that is affordable to a broader range of groups?
d. What is the nature of the relationship between the private housing sector and government (particularly with the Lands and Physical Planning Departments) (antagonistic, evasive, coordinated, close)?
e. What types of enabling capacities need to be strengthened so that the private sector can more effectively meet the housing needs of your target group?

3) ***Political drivers***

a. What is your personal view of urban growth?

Tick appropriate box

Urban growth should be discouraged because too many people are moving to town	Urban growth should be slowed to a more manageable pace	The pace of urban growth does not pose a problem	Urban growth should be anticipated through proper planning and service provision	Urban growth should be accelerated because of its social and economic benefits

Serial number: __

Semi-structured interview guide for NGO practitioners

The semi-structured interview guide addresses research objective c and d:

- *To identify the constraints (socio-economic, institutional and political) facing the ability of local stakeholders (government, communities, local NGOs, and the private sector) to plan and manage healthier living environments in Karonga Town, particularly as it continues to rapidly grow and expand.*
- *To identify the type of enabling capacities that need to be strengthened so that these stakeholders can plan and manage healthier living environments in this context.*

QUESTIONS

- ***Introductory questions***
  - What is your organisation's mandate? What services does it provide?
  - What is your position and role?

4) ***Socio-economic constraints***

j) What are the socio-economic characteristics of your target population in Karonga Town?

k) What are the environmental characteristics of the communities in which your target population lives?

l) Where are these communities located (urban/peri-urban)? What are their needs and priorities?

m) What share of the whole population in Karonga Town would you say has access to the service your organisation delivers? (Does your organisation have data on levels of access in the town? If so, would you be able to share this data?)

Tick appropriate box

0-25%	25-50%	50-75%	75-100%

n) What are the reasons why certain groups are unable to access adequate services in Karonga Town (poverty, neglect, absence of accountable institutions?)

5) ***Institutional constraints***

a. Are there any low-cost technologies or planning solutions that your organisation is using?

b. What kind of enabling capacities need to be built so that these solutions can be scaled-up in Karonga Town? Whose capacity needs to be built (community, government, civil society, communities)?

c. Why has your organisation stepped in to deliver services (poverty, neglect, lack of accountable institutions)?

d. How many other civil society organisations are working to deliver these services in Karonga Town?

e. What are the platforms or mechanisms in place to coordinate the efforts of service providers in the town?

f. Are service providers sufficiently coordinated?

g. Are service approaches coordinated or piece-meal? Why is this?

h. What share of your organisations budgets go toward humanitarian response versus prevention/development?

i. Is the current approach to service provision reactive or proactive?

6) ***Political drivers***

a. Who is your organisation accountable to?

b. How has decentralisation (administrative and fiscal) helped or hindered the ability of your organisation to fulfil its mandate?

c. How are traditional leaders currently involved in any decision-making processes that are relevant to the services your department is responsible for providing?

d. How do public officials generally view the role of traditional leaders in decisions regarding service provision and land allocation?

e. Have you witnessed any conflicts between formal government and traditional leadership structures? How have these conflicts impacted physical planning and service provision?

f. What is your personal view of urban growth?

Tick appropriate box

Urban growth should be discouraged because too many people are moving to town	Urban growth should be slowed to a more manageable pace	The pace of urban growth does not pose a problem	Urban growth should be anticipated through proper planning and service provision	Urban growth should be accelerated because of its social and economic benefits

Serial number: __

Semi-structured interview guide for community members and leaders

The semi-structured interview guide addresses research objective c and d:

- *To identify the constraints (socio-economic, institutional and political) facing the ability of local stakeholders (government, communities, local NGOs, and the private sector) to plan and manage healthier living environments in Karonga Town, particularly as it continues to rapidly grow and expand.*
- *To identify the type of enabling capacities that need to be strengthened so that these stakeholders can plan and manage healthier living environments in this context.*

QUESTIONS

- ***Introductory questions***
  - How long have you lived in your community?
  - Do you have any special roles or responsibilities in the community?
- ***Socio-economic constraints***
  - o) What share of your community has access to piped water connections (including communal water taps)?

Tick appropriate box

0-25%	25-50%	50-75%	75-100%

p) What share of your community has access to safe sanitations facilities (flush/pore toilets connected to a sewerage system, including septic tanks)?

Tick appropriate box

0-25%	25-50%	50-75%	75-100%

q) Is your community served by a functional and comprehensive drainage network that is able to effectively remove surface water from the area?

r) Is your community served by a safe and reliable solid waste collection system? If so, what kind of system is it? If not, how is solid waste mainly disposed of in the community?

s) Are residents in your community able to afford the cost of accessing public services (such as piped water connections and on site sanitation facilities) provided by the government? If not, what is the share of the community that is unable to afford such services?

Tick appropriate box

0-25%	25-50%	50-75%	75-100%

t) What share of the community lives in the following types of housing?

Record share for each housing type

Permanent housing (constructed with a combination of permanent and traditional materials)	Semi-permanent housing (constructed with a combination of permanent and traditional materials)	Temporary (constructed with sun dried brick, mud floors and grass thatch)
%	**%**	**%**

u) How do community members who lack access to such services gain access to them? Are these alternative services safe and reliable to use? Who provides these services (informal and private actors, non-governmental actors, the surrounding environment)?

v) Are residents in your community able to afford the costs of complying with formal building regulations (such as proper building materials)? If not, what share of the community is unable to afford those costs?

w) Are residents in your community able to afford the costs of complying with formal standards for on-site sanitation? If not, what share of the community is unable to afford those costs?

Tick appropriate box

0-25%	25-50%	50-75%	75-100%

x) In your view, are current formal regulations and standards appropriately suited to the realities of people who live in your community? If not, what kind of changes need to be made so that regulations are more appropriate for your community?

y) Are you aware of any low-cost technologies or planning solutions that could work to increase access for the poorest groups? If so, what are they? Who is involved?

7) ***Institutional constraints***

a. What are the most important needs and priorities in your community?
b. To what extent do you feel that the general needs and priorities of your community are recognised and addressed by government?
c. Do you feel like formal government is too far removed from the needs and priorities of your community?
d. Do you feel like the government views your community as legitimate (in terms of having needs formally recognised)?
e. Do you feel like your community has been meaningfully involved in formal decision-making processes involving Physical Planning (such as decisions about land use) and service provision (such as decisions about where priorities are highest)?
f. Are there any community organisations present in your community? If so, what role do community organisations play in the provision of basic service (such as water and sanitation, solid waste management, drainage, sewerage, electricity, roads)?
g. What types of enabling capacities need to be strengthened so that your community can take action to address its needs and priorities?
h. Do these needs and priorities need to be addressed in partnership with any other actors in the town (such as government, private sector, NGOs)?

8) ***Political drivers***

a. Is the land that your settlement is on legally recognised by government?
b. Do you feel like your land tenure is secure? If not, how does this influence your willingness to invest in housing improvements and services provision?
c. Are there traditional leaders in your community? If so, what is their role?
d. How are traditional leaders currently involved in formal decision-making processes involving Physical Planning and public service provision?
e. How do you think District Council views the role of traditional leaders in general?

f. Do conflicts arise between District Council and traditional leadership structures? If so, how do these conflicts impact the community (particularly with regard to land management and service provision)?
g. What is your personal view of urban growth?

Annex VI: Key informants

S/N	Recording number	Informants	Organisation/Affiliation	Date
1	KAR015	Commissioner for Physical Planning, Head of Planning Department	Department of Physical Planning	17 February 2017
2	KAR016	Chief Urban Development Officer	Ministry of Lands, Housing and Urban Development	17 February 2017
3	KAR017	President of Malawi Institute of Physical Planners (MIP)	Mzuzu University	19 February 2017
4	KAR018	Group Village Headmen (GVH)	Village anonymised (there is only one GVH at the GVH level)	21 February 2017
5	KAR019	Private home builder	Mwahimba village	21 February 2017
6	KAR020	Village headmen	Mwahimba village	21 February 2017
7	KAR021	Lands Officer	Ministry of Lands	24 April 2017
8	KAR022	Technical Officer	Northern Region Water Board, Mzuzu	04 August 2016
9	KAR023	Village headmen	Mwahimba village	06 August 2016
10	KAR024	Village headmen	Mwahimba village	06 August 2016
11	KAR025	Chair of the VDC Committee for Mwahimba	Mwahimba Village	06 August 2016
12	KAR026	Lands Officer	Ministry of Lands	05 August 2016
13	KAR027	Desk Officer for Disaster Risk Management	Karonga District Council	05 August 2016
14	KAR028	Physical Planner	Karonga District Council	08 August 2016
15	KAR029	Market Chairperson	The central market	26 April 2017
16	KAR029	Project Officer	USAID	23 May 2017
17	KAR030	Director of Planning and Development	Karonga District Council	17 July 2017